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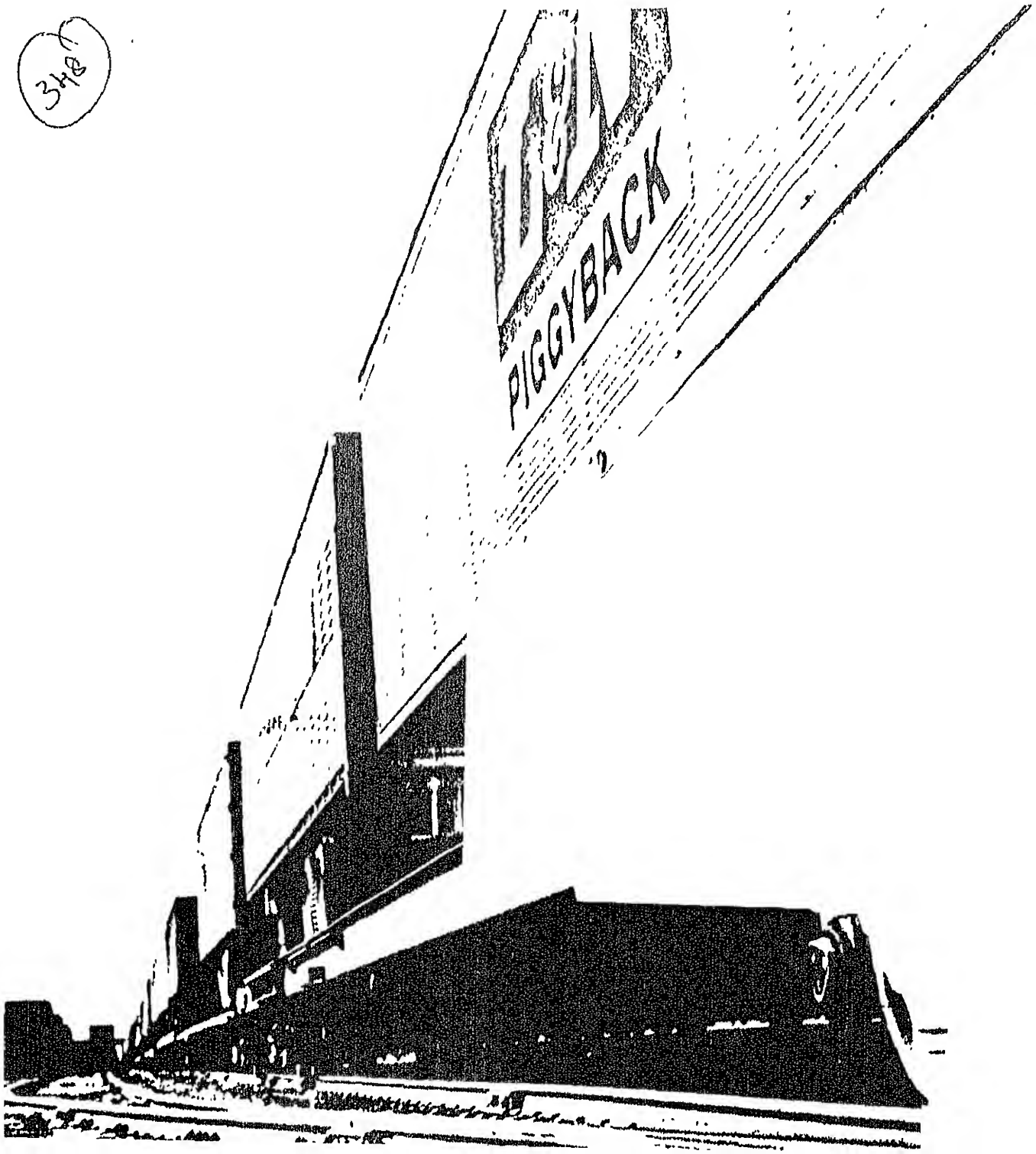
# Shipping Alternatives for Moving Florida Produce to Eastern and Midwestern Markets



# Shipping Alternatives for Moving Florida Produce to Eastern and Midwestern Markets

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SHIPPING ALTERNATIVES FOR MOVING FLORIDA PRODUCE TO EASTERN AND MIDWESTERN MARKETS, by Keith A. Klindworth and Eldon E. Brooks; Office of Transportation, U.S. Department of Agriculture.

**Notes**

This study was conducted in cooperation with the Florida Citrus Packers of Lakeland, Florida, under a cooperative agreement formed pursuant to the Agricultural Marketing Act of 1946 (7 U.S.C. 1621 et seq, Sections 20(a) and 453(b)).

Use of the names of companies and their products is for identification only and does not imply endorsement or evaluation by the U.S. Department of Agriculture.

Cover photograph is courtesy of the Association of American Railroads, American Railroads Building, 1920 L Street, N.W., Washington, D.C. 20036

**Abstract**

A significant shift in modal market share has occurred in the movement of Florida fresh fruits and vegetables within the last twenty years with a resulting complete dependence by Florida produce shippers on truck transportation at present. Evaluation of shipping alternatives to truck transportation concentrated on a cost and service comparison of a potential Plan III TOFC shipping program with present truck transportation for the Florida producers. The feasibility of Plan III TOFC shipping to each of seven market areas for Florida produce was found to vary according to assumptions concerning equipment turnaround time and level of backhaul that the shippers obtain. However, under operating information as provided by present TOFC shippers, a Plan III TOFC program for Florida produce shippers was found competitive with present truck transportation to several market areas. The study also examined various entry considerations for shippers wishing to establish a Plan III TOFC shipping program.

Keywords: Produce, Fruits, Vegetables, Shipping, Transportation, TOFC, Trailer on flatcar, Intermodal, Florida

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## Preface

Growers and shippers in Florida are vitally concerned about the availability of equipment, both rail and truck, to transport the fresh and frozen fruits and vegetables that are grown in the state and shipped to major markets throughout the United States and Canada.

There has been a rapid and continuing decline on the part of the railroads in both service and numbers of mechanical refrigerator cars and piggyback trailers, or trailer on flatcar (TOFC), for moving perishable products to market. In addition, due to increasing replacement costs of trucking equipment, high fuel costs, and restrictions on load limits in certain States, there is concern that the number of independent trucks available, particularly for long-distance movements to northeastern, midwestern, and western markets, will decline.

Florida growers and shippers believe the solution to their problem may be in alternative shipping methods that can be used to supplement their present shipping program.

The Office of Transportation of the U.S. Department of Agriculture (USDA) was asked by the Florida Citrus Packers to evaluate the various shipping alternatives for moving their products to market, including shipper owned, leased, or contracted trailers for use in TOFC rail service.

Based on the request, study objectives were designed to:

1. Develop a profile of the present shipping flow and transportation and handling system.

2. Evaluate service requirements for shippers, receivers, and products.

3. Determine impacts of rail deregulation of fruits and vegetables and recent TOFC deregulation on Florida shippers.

4. Evaluate use of advanced design applications for refrigerated and ventilated transportation equipment.

5. Develop an optimum loading and handling system.

6. Develop a best estimate of total truck and piggyback operating costs between Florida and the major eastern and midwestern markets.

7. Compare the economic feasibility of a Plan III TOFC shipping program with present truck transportation.

8. Develop alternative organizational structures for implementing a Plan III TOFC shipping program.

## Contents

## Tables

## Summary and Recommendations

Due to its long and favorable growing season, Florida produces a wide variety of fruits and vegetables for a significant share of total U.S. fruit and vegetable production:

-- In 1979, the Florida producing area shipped 68,258 units of 1,000 cwt (1,000 times 100 pounds) to domestic markets accounting for 17.3 percent of the total U.S. shipments of fresh fruits and vegetables.

-- Fruit and vegetable shipments from Florida are highly seasonal, varying from a May high point of 12,084 (1,000 cwt) to a low point in September of 217 (1,000 cwt).

-- Truck transportation accounts for 99 percent of the fruit and vegetable movement from Florida. Rail, TOFC and air shipments of fresh fruits and vegetables are insignificant.

-- A significant shift in modal market share has occurred in the movement of Florida fresh fruits and vegetables to market: in 1964, nearly 30 percent of this traffic from Florida went by rail share compared with the present rail share of only 1 percent.

-- Although many of the products are still loaded manually, the trend is toward unitization of shipments.

Receivers desire service to their markets that is fast, reliable, and accommodates their handling preferences:

-- While fast service time is desirable to the typical produce receiver because it allows the receiver to maintain lower inventory levels, almost all receivers indicated service reliability was a more important shipping requirement.

-- Receivers prefer the smaller size of truck and TOFC shipments to those of refrigerated railcar.

-- Receivers perceive the incidence of perishable damage to be greater in railcar and TOFC shipments than in truck shipments.

The type and feasibility of any alternative shipping program will be determined by the supply and availability of different types of transportation equipment:

-- The supply and availability of trucks varies according to the rate level in the Florida area; truck supply is national in origin, and as rates in Florida for outbound

produce shipments rise, more truckers shift to the Florida producing area.

-- The supply and availability of railroad refrigerator railcars suitable for moving produce is declining. The trend of the railroads is definitely away from refrigerated trailer ownership for TOFC use. However, the supply of flatcars available for TOFC/COFC use has increased significantly in recent years.

The real impact of the May 28, 1979, exemption of certain commodities, including fresh fruits and vegetables, from economic regulation was the creation of a more favorable investment environment without the concerns of regulation for prospective entrants into TOFC transportation of fruits and vegetables.

Because railroads are reluctant to make the equipment investment required of other TOFC plans, Plan III TOFC appears to be the most feasible TOFC plan for a prospective entrant into TOFC shipping.

On a service comparison with present truck transportation out of Florida, Plan III TOFC will be highly competitive if the railroads provide the service they have guaranteed.

On a cost comparison with truck transportation out of Florida, the competitiveness of Plan III TOFC varies according to assumptions concerning the equipment turnaround time and the level of backhaul that the shippers obtain. Using estimates of turnaround time provided by present TOFC shippers, total per trailer TOFC costs were calculated to seven major produce markets at six different levels of backhaul. These total TOFC costs, obtained during December 1980, were then compared to average weekly truck rates from Florida for the 1979-80 shipping season in order to determine the feasibility of Plan III TOFC shipping vis-a-vis truck shipping to each market area.

Conclusions concerning the feasibility of TOFC shipping to each of the market areas in this study are expressly limited to TOFC shipping and TOFC cost calculations under the study's specified operating assumptions. For example, an important

participating railroads, contemplated TOFC service to the Northeast by special low-profile flatcars to a Philadelphia destination TOFC ramp. Total TOFC costs to the market areas of Philadelphia, New York, and Boston were calculated under this assumption. Because total TOFC cost is directly related to the destination TOFC ramp's proximity to the market area, the reader should use care in drawing broad inferences concerning the feasibility of Plan III TOFC service to these market areas from this study's findings without consideration of the study's underlying operating assumptions for calculation of Plan III TOFC cost. A change in operating patterns by the railroads, such as establishment of direct TOFC service, would likely significantly improve the cost competitiveness of Plan III TOFC to these areas.

The authors addressed various entry considerations for implementing a Plan III TOFC shipping program for a group of shippers. These included organizational alternatives, management, acquisition of trailers, types and sizes of trailers, types of trailer refrigeration equipment, comparative trailer cost, trailer maintenance, and commitments by the individual parties.

Since the Florida shipping season is highly seasonal, full utilization of trailers year round is unlikely to occur unless alternative uses can be found for trailers during the slow summer months. For example, California, with its complementary shipping flow to Florida, is an ideal candidate for an equipment exchange agreement.

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# Section 1
# Profile of Present Transportation and Handling System

For our analysis of the present transportation and handling system of Florida fruit and vegetable producers, we emphasized a definition of the historical shipping patterns by the shippers and the shipping requirements of the receivers in the major market areas as established by shipping patterns. In addition, we discussed equipment constraints as they influence any alternative transportation system for the Florida producers and briefly discussed the impact of rail and trailer on flatcar (TOFC) deregulation on the potential development of intermodal transportation.

## Shipping Patterns of Florida Producers

Data on the number and destinations of shipments of Florida fruits and vegetables were obtained from the USDA Fruit and Vegetable Division, which publishes fresh fruit and vegetable shipment information by commodities, modes of transportation, origins, and months, and fresh fruit and vegetable unload information in major market areas by commodities, origins, and months. 1/ From this basic information, we analyzed the Florida producing area's shipping patterns in terms of four criteria: shipping flow by amounts and destinations of shipments, seasonality of shipments, modal market share of shipments, and handling and loading procedures by shippers.

### Shipping Flows

Due to a long and favorable growing season, Florida produces a wide variety of fruits and vegetables that make up a significant share of the total U.S. production. In 1979, the Florida producing area accounted for approximately 15.7 percent of the

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1/ See USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, which summarizes domestic rail and piggyback shipments, available truck and air shipments, and exports of fresh fruits and vegetables by commodities, modes of transportation, origins, and months. USDA Fresh Fruit and Vegetable Unload Totals, 1979, FVUS-5, reports fresh fruit and vegetable unload totals for 41 U.S. cities by commodities, origins, and months. Detailed unloads by commodities, origins, and modes for the individual cities in the 41 U.S. and 5 Canada cities groups may be found in the appropriate regional summaries released annually -- Eastern Cities (FVUS-1); Midwestern Cities (FVUS-2); Southern Cities (FVUS-3); and Western Cities (FVUS-4). Data in both the shipment and unload totals should not be interpreted as representing total movements from origins shown, but they are the best nationwide information indicating origins and destinations of fruits and vegetables at present.

total U.S. shipments of fresh fruits and vegetables. 2/ Total Florida shipments to domestic markets were approximately 68,258,000 cwt in 1979. 3/ The shipment amounts of the 10 fruits and vegetables that represent over 80 percent of total fruit and vegetable shipments from Florida to domestic markets are detailed in table 1:

Table 1--Fruit and vegetable shipments from Florida by commodity, 1979

| Commodity | Shipments | Percentage of total | Cumulative total |
|---|---|---|---|
| | 1,000 cwt | ------- Percent ------- | |
| Grapefruit | 11,147 | 16.33 | 16.33 |
| Oranges | 9,209 | 13.49 | 29.82 |
| Tomatoes | 8,437 | 12.36 | 42.18 |
| Watermelons | 5,518 | 8.08 | 50.26 |
| Potatoes | 4,739 | 6.94 | 57.20 |
| Sweet corn | 3,889 | 5.70 | 62.90 |
| Celery | 3,774 | 5.53 | 68.43 |
| Cabbage | 3,365 | 4.93 | 73.36 |
| Tangerines | 3,025 | 4.43 | 77.79 |
| Cucumbers | 1,942 | 2.85 | 80.64 |
| Other commodities | 13,213 | 19.36 | 100.00 |
| Total shipments | 68,258 | 100.00 | - |

USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, 1980.

Since these 10 items account for a high percentage of total domestic shipments of Florida fruits and vegetables, we concentrated on these 10 rather than detail shipping flows for other fruits and vegetables that have only a minor portion of total shipping flow.

2/ See USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, where total reported domestic shipments, including rail, piggyback, available truck, and available air, from Florida were 68,258,000 cwt and total reported domestic shipments, including rail, piggyback, available truck, and available air, throughout the U.S. were 435,356,000 cwt in

3/ Ibid, p. 31,32.

Domestically, Florida fruits and vegetables are shipped to numerous market areas around the United States. Using information gained from the USDA Fruit and Vegetable Division, we determined that 43 percent of total domestic shipments from Florida go to a group of 14 cities in the Eastern and Midwestern United States. Although no one city or market area has a large market share of total shipments from Florida, together these 14 receive a significant portion of the total Florida fruit and vegetable shipments. Note that New York, with an 8.83 percent market share, represents a market area that received 603,000,000 pounds of Florida fruits and vegetables in 1979 which, at 45,000 pounds per truckload, would require a total of 13,400 truck trips to service the market area in an average year. Table 2 shows the major destinations of Florida fruits and vegetables by city and mode for 1979.

Table 2--Florida fruit and vegetable unloads by city and mode, 1979

| City | Rail | Truck | Total | Market share 1/ |
|---|---|---|---|---|
| | ------- | 1,000 cwt | ------- | -Percent- |
| New York/Newark | 78 | 5,952 | 6,030 | 8.83 |
| Philadelphia | 0 | 2,679 | 2,679 | 3.92 |
| Boston | 2 | 2,559 | 2,561 | 3.75 |
| Toronto | 2 | 2,143 | 2,145 | 3.14 |
| Baltimore/Washington | 0 | 2,136 | 2,136 | 3.13 |
| Atlanta | 0 | 1,831 | 1,831 | 2.68 |
| Chicago | 3 | 1,790 | 1,793 | 2.63 |
| Montreal | 0 | 1,715 | 1,715 | 2.51 |
| Detroit | 0 | 1,661 | 1,661 | 2.43 |
| Miami | 0 | 1,623 | 1,623 | 2.38 |
| Cincinnati | 493 | 1,005 | 1,498 | 2.19 |
| Pittsburgh | 0 | 1,189 | 1,189 | 1.74 |
| Columbia | 0 | 1,203 | 1,203 | 1.76 |
| Cleveland | 15 | 1,159 | 1,174 | 1.72 |
| Total | 593 | 28,645 | 29,238 | 42.83 |

1/ Calculated by dividing Florida fruit and vegetable unloads for the particular city by total domestic fruit and vegetable shipments from Florida.

USDA, Fresh Fruit and Vegetable Unloads, 1979, FVUS-4, 1980.

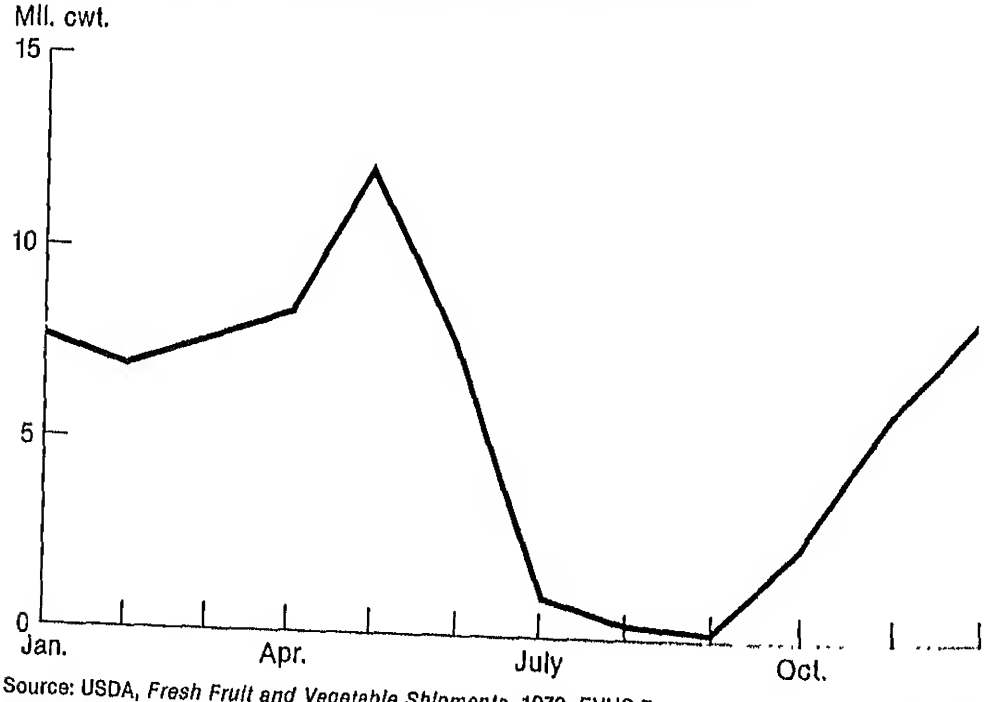
For Florida fruit and vegetable unloads by city and commodity for 1979 and 1978, see appendix tables 1-6, where a market share of the unloads of each Florida fruit and vegetable as compared with total unloads of each fruit and vegetable is also presented for both years.

Seasonality

Data on domestic fruit and vegetable shipments per month shown in table 3 and illustrated in figure 1 indicate that fruit and vegetable shipments from Florida are highly seasonal -- varying in 1979 from a May high point of 12,084,000 cwt to a low point of 217,000 cwt in September. Although export shipments are not included, only 7 percent of Florida's total fruit and vegetable shipments are for export and the monthly shipment data indicate that export shipments are as seasonal as

Figure 1

**Florida's Fresh Fruit and Vegetable Shipments, 1979**




Source: USDA, *Fresh Fruit and Vegetable Shipments*, 1979, FVUS-7

Table 3--Domestic fruit and vegetable shipments from Florida by mode and month, 1979

| Month | J | F | M | A | M | J | J | A | S | O | N | D | Total 1/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1,000 cwts | | | | | | | | | | | | |
| Rail: | 4 | 1 | - | - | - | - | - | - | - | - | - | 3 | 8 |
| TOFC: | 60 | 58 | 74 | 89 | 240 | 206 | 6 | - | - | 24 | 39 | 70 | 866 |
| Truck: | 7,581 | 6,841 | 7,536 | 8,216 | 11,844 | 7,348 | 1,002 | 306 | 217 | 2,460 | 5,799 | 8,200 | 67,350 |
| Air: | 11 | 7 | 11 | 3 | - | - | - | 1 | - | - | - | 1 | 34 |
| Total: | 7,656 | 6,907 | 7,621 | 8,308 | 12,084 | 7,554 | 1,008 | 307 | 217 | 2,484 | 5,838 | 8,274 | 68,258 |

1/ Modal shipments as a percentage of total shipments:

Rail = (insignificant)
TOFC = 1.29%
Truck = 98.67%
Air = (insignificant)

USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, 1980.

domestic shipments. 4/ Data showing the seasonality of Florida shipments of fruit and vegetable are given in appendix table 7.

Modal Market Share

The 1979 data in table 3 concerning the modal share of Florida fruit and vegetable shipments indicate that rail, TOFC, and air shipments are insignificant in comparison with total domestic shipments from Florida. Actual TOFC and rail shipments accounted for only 1 percent of total shipments; truck shipments accounted for the remaining 99 percent of the shipments in 1979.

In the past 30 years, a significant shift has occurred in the mode of transportation used by Florida fruit and vegetable shippers. In 1950, 54 percent of Florida fresh fruits and vegetables were shipped by rail as compared with the present market share of only 1 percent of total fresh fruit and vegetable shipments. 5/ With the exception of shipments for the export market, practically all fresh fruits and vegetables are handled by trucks. The net result is that Florida shippers and growers are completely dependent on trucks to move their product to market.

Appendix table 7 provides data on the modal share of Florida fruit and vegetable shipments by month and commodity. Note that the predominant commodity moved by TOFC from Florida in 1979 was radishes, with 58 percent of the total TOFC shipments, even though radish shipments for last year were only 1 percent of total shipments from Florida. This level of usage of TOFC transportation for radishes is partially the result of a highly successful Plan III TOFC shipping program from Florida to Cincinnati. Although radishes may be less susceptible to spoilage and more conducive to shipment by a dry piggyback operation than other more perishable fruits and vegetables, this shipping program illustrates a working Plan III TOFC operation and the potential for the establishment of a similar shipping program for the Florida producers.

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4/ See USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, where available exports from Florida of fruits and vegetables are given as 5,042 (1000 cwt) and total fruit and vegetable shipments, including both domestic and export shipments, are given as 73,300 (1000 cwt).

5/ Volume 3, "A Profile of Fresh Fruit and Vegetable Shipments From Selected Areas", A Long-Term Study of Produce Transportation prepared for the U.S. Department of Transportation and National Bureau of Standards by Manalytics, Inc., December, 1977, p. 18.

## Handling and Loading Procedures

Many of the products covered in this study are still manually loaded and handled one package at a time. However, due to rising labor costs, there is a trend toward unitization on pallets, slipsheets, or bins, and mechanical loading with fork trucks. There is no one unitized handling system that will accommodate all shippers and receivers. Palletization has been used for years in Florida by some shippers for inhouse product handling, but not for transport. Various factors such as shipping weight, cost, recycling, and repair of pallets have tended to retard general adoption of this system. Much of the Florida citrus industry now uses slipsheets as a means of unitization without pallets, while some melon shippers are using bins on a regular basis.

Shippers wishing to consider a unitized loading and handling system should carefully consider the compatibility of various systems with existing transport equipment and with other systems in use by receivers before adopting one. Bouma and Shaffer have reported information on handling unitized grocery products, some of which is applicable to the commodities shipped from Florida. 6/ Many commercial firms provide assistance for developing a unitized handling system tailored to a specific operation. In addition, the following USDA offices offer technical advice:

1. Market Quality and Transportation
   Horticultural Research Lab.
   U.S. Dept. of Agriculture,
   2120 Camden Road
   Orlando, Florida 32803 Phone: 305/898-6791

2. Marketing Systems Group
   Market Research & Development Division
   U.S. Dept. of Agriculture, AMS
   Room 120, Bldg. 307, BARC-East
   Beltsville, Maryland 20705 Phone: 301/344-2810

3. Transportation & Packaging Research Branch, READ
   U.S. Dept. of Agriculture, Office of Transportation
   Room 210, Bldg. 006, BARC-West
   Beltsville, Maryland 20705 Phone: 301/344-2815

6/ Bouma, John C., and Paul F. Shaffer. Systems for handling grocery products from supplier to distribution warehouse. U.S. Dept. Agr., ARS, Market. Res. Rpt. No. 1075, 1978.

## Receivers' Shipping Requirements

Receivers of Florida fruits and vegetables in the northeast and midwest market areas want transportation service to their cities that is fast, reliable, and accommodates their handling preferences. 1/

### Service Time to Market Area

In order to compete successfully in the fresh produce business, receivers need consistently fast service from the growing area to their warehouses. Fast service is desirable to the typical receiver since it shortens order cycle time, the time when the order is placed until the produce is received, and a short order cycle allows the receiver to maintain a lower inventory level. Maintenance costs of a perishable inventory are high, since a controlled environment must be provided and spoilage reduces the market value of the produce. Consequently, a fresh fruit and vegetable receiver needs a fast service time to reduce carrying costs associated with a high inventory level, to reduce the risk of a quality decline in the produce while in stock, and to reduce the risk of market price fluctuations between the time the order is placed and the time the produce is received.

Timing is critical to wholesale produce receivers. The industry is highly competitive and if one receiver fails to provide high quality produce, a competitor will. Receivers are in a vulnerable position because they typically order highly perishable produce from a long distance. If shipments arrive in less than top condition, the receiver has few options. A receiver can accept the loads and try to compete with competitors with an inferior product, reject the shipment outright and be removed temporarily from the market, or attempt to negotiate a price reduction because of substandard quality. Since none of these options provides an attractive solution to the problem, receivers are understandably concerned about fast delivery of produce of top grade and quality.

### Service Reliability to Market Area

In our discussions with receivers, we found that while service time and cost were important shipping requirements, almost all receivers indicated that service reliability was a more important shipping requirement. If produce deliveries are consistent and predictable, receivers are able to place orders with confidence that they will be able to make each morning's

market. Presented with a choice of unusually fast but unreliable delivery, compared with a slightly slower but highly reliable delivery, most receivers chose the dependable delivery, since the slower delivery time, although less desirable, could be taken into account by ordering earlier. When receivers can depend on a delivery time, they can organize promotional and marketing activities in advance in anticipation of the specific delivery time and can maintain lower inventory levels.

Handling Preferences

Receivers indicate that several considerations other than service time and reliability also influence modal selection. For instance, the smaller size of truck and TOFC shipments, compared with refrigerated railcar shipments, allows the receiver to place smaller orders. These smaller orders result in more frequent deliveries, higher inventory turnover, and less spoilage. Because independent owner-operators need to keep their vehicles on the road, they have a tendency to unload their vehicles faster than the railroad, where it is the receiver's responsibility to unload once the railroad "spots" the car. Also, truckers are able to give personalized attention to their loads and can often correct a potentially serious shipment problem en route, whereas railroads have typically been unable to give such attention to each shipment. Correspondingly, the incidence of perishable damage in truck shipments is considered by receivers to be much less than in railcar shipments.

While the railroads have been perceived as providing inconsistent and unreliable service with mechanically refrigerated railcars in the past, many receivers are now participating in the newly developed piggyback operations from California and would welcome a piggyback program from Florida if service were competitive with trucks. The railroads have proven in the past that they can provide the requisite service levels to make a TOFC shipping program a viable alternative to complete reliance on truck transportation. What is needed, however, is a commitment by shipper groups to provide a guaranteed volume level of usage if the railroads agree to provide service that is competitive with present truck transportation.

Product Requirements

Both the physical and physiological requirements of fresh fruits and vegetables must be met to maintain quality and minimize transit losses ("The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks," Agricultural Handbook No. 66, by Lutz and Hardenburg). Table 4 includes some basic recommendations from this handbook on the commodities covered in this report. More detailed information on individual commodities can be obtained from the handbook.

Table 4--Recommended temperature, relative humidity, and highest freezing point for fresh fruits and vegetables in transit

| Commodity | Recommended temperature F° | Relative humidity percent | Highest freezing point F° |
|---|---|---|---|
| Cabbage | 32 | 90-95 | 30.4 |
| Celery | 32 | 90-95 | 31.1 |
| Cucumbers | 45-50 | 90-95 | 31.1 |
| Grapefruit (Florida) | 50 | 85-90 | 30.0 |
| Oranges (Florida) | 32 | 85-90 | 30.6 |
| Potatoes (early) | 40 | 90 | 30.9 |
| Sweet corn | 32 | 90-95 | 30.9 |
| Tangerines | 32-38 | 85-90 | 30.1 |
| Tomatoes (mature green) | 55-60 | 85-90 | 31.0 |
| Watermelons | 40-50 | 80-85 | 31.3 |

Lutz, J. M., and R. E. Hardenburg. The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks, AH-66. USDA, 1977.

These physical requirements of fresh fruits and vegetables must be noted, as they influence the type of refrigeration and heating equipment which must be provided on the trailers. Table 4 shows that cabbage, celery, oranges, tangerines, and sweet corn have a lower recommended transport temperature than cucumbers, grapefruit, tomatoes, and watermelons. Accordingly, some crops will require refrigeration to a greater extent on the average haul out of Florida than other crops which may not need refrigeration at all and might be shipped in dry vans during certain times of the year. For this study, we will assume that a refrigeration and heating unit will have to be provided on the TOFC vans, although during certain times of the shipping season, it might be used minimally or not at all to some market destinations.

## Equipment Needs

The type and feasibility of any alternative shipping program for Florida fruit and vegetable producers will be greatly determined by the supply and availability of different types of transportation equipment. Also, new transportation concepts and different types of rail and truck equipment, as they are developed and become workable, may present viable shipping

options that must be evaluated along with equipment currently in use.

Supply of Trucks

As was stated before, 99 percent of the fresh fruit and vegetable shipments from Florida are by truck. When one transportation mode has a dominant market share of shipments from an area, shippers become dependent on that mode and supply and availability of the dominant mode may become critical during peak periods of the shipping season. Due to the high variation of monthly shipments from Florida throughout the shipping season, great strains are placed on truck transportation, which on occasion have resulted in spot shortages. In addition, although enough trucks may be made available at these peak shipping periods, they are often able to command premium rates above those in periods when the demand for trucks is less.

During interviews with shippers, we were told that the supply and availability of trucks had been a critical concern during peak shipping periods in the past. Apparently, many shippers have encountered crisis periods of supply and availability problems during a 10-day period around the Christmas and New Year's holiday season, and during April and May when vegetable production peaks. Although we found evidence of such truck supply and availability problems in past years, the situation apparently varies greatly from year to year according to supply and demand. Shippers interviewed during the holiday season of 1980 reported no availability problems and indicated the supply of trucks at competitive rates was about as good as it had ever been.

Supply of Railroad Equipment

Over the past 30 years, the railroads have used three basic types of railcars to transport fresh fruits and vegetables: ice-bunkered, insulated, and mechanical refrigerated.

Until the mid-1950's, the prevailing technology for the movement of fresh produce by rail was the ice-bunkered railcar. Early ice-bunkered cars were basic boxcars utilizing bins filled at origin with ice and salt and replenished at points along the route to cool and humidify the produce load during the summer (portable heaters were used in the winter to warm the produce). Although later designs incorporated a variety of improvements, such as floor racks, insulation, air circulation fans, and vent doors, ice-bunkered cars were gradually replaced by mechanical refrigerated cars after their development in the early 1950's. The reasons for the demise of the ice-bunkered cars were a combination of obsolescence and cost. The mechanical refrigerated cars, with self-contained heating and cooling units, offered a more consistent and dependable protection to perishables during transit in all seasons. Al-

so, with their greater cubic capacity, they were more attractive for dry freight on the backhaul than the ice-bunkered cars with their bulky ice bunkers and airflow chambers. Although ice-bunkered cars transported some types of produce well in some circumstances, one significant disadvantage of these cars to the railroads was that they had to maintain icing stations on the produce routes. 8/ Whatever the reason, no ice-bunkered cars for produce use have been built since the mid-1950's, and the remaining cars have been phased out gradually.

Insulated cars provided some protection against outside climatic conditions, but no cooling or heating units were provided on these cars. Although these cars could rarely be used for long hauls of the more perishable commodities, an insulated boxcar could provide adequate protection for shipping potatoes, onions, and citrus to northern markets if the outside temperature were approximately $10^{\circ}$ - $32^{\circ}$ F and the cargo were promptly unloaded at destination. The insulated cars, not providing refrigeration or heating units, were less expensive and offered a larger cubic capacity than mechanical refrigerated cars.

After the mid-1950's, the mechanical refrigerated cars gradually became the standard railcar used in the hauling of produce. The car was similar in design to the ice-bunkered cars except that its self-contained cooling/heating unit provided a constant temperature regardless of outside climatic conditions and did not require icing stations along the produce route. Although it was the industry standard for many years, virtually no mechanical refrigerated cars have been built for produce service since the early 1970's.

The trends since 1955 in the numbers of cars suitable for hauling produce are illustrated in table 5. While the downward decline in the number of ice-bunkered cars since the mid-1950's is easily discernible, trends in insulated and mechanical refrigerated car ownership are not as evident.

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8/ See Investigation and Suspension Docket No. 8720, Icing Services U.S. Railroads, 343 ICC 67, where the Commission allowed the railroads to discontinue icing, re-icing, salting and resalting services upon an argument by the railroads that "the ice bunkered cars were made obsolete by the mechanical cars; that the existing ice cars and icing facilities had deteriorated to a point that they must be retired soon; that this service was being provided at less than cost; and that they have sufficient mechanical cars available to meet all reasonable shipper needs."

Both categories of railcars show increases through the early 1970's. However, ownership totals began to gradually decline in 1976 for the insulated cars and in 1975 for the mechanical refrigerated cars. They have declined steadily up to the present -- indicating that the supply and availability of these two types of railcars is definitely diminishing.

Table 5--Numbers of railcars used in hauling fresh fruits and vegetables, January 1, selected years, 1955-80

| Year | Ice-bunkered | Insulated | Mechanical refrigerated | Total |
|---|---|---|---|---|
| 1955 | 101,240 | 4,974 | 612 | 106,826 |
| 1960 | 81,684 | 11,498 | 3,724 | 96,906 |
| 1965 | 57,137 | 30,730 | 9,671 | 97,538 |
| 1970 | 34,639 | 53,803 | 20,168 | 108,610 |
| 1971 | 31,083 | 58,139 | 22,834 | 112,056 |
| 1972 | 25,501 | 61,537 | 24,287 | 111,325 |
| 1973 | 18,866 | 64,676 | 25,469 | 109,011 |
| 1974 | 15,866 | 67,581 | 26,041 | 109,488 |
| 1975 | 12,052 | 69,253 | 25,020 | 106,325 |
| 1976 | 9,144 | 70,668 | 23,893 | 103,705 |
| 1977 | 7,067 | 67,755 | 22,957 | 97,779 |
| 1978 | 4,130 | 66,809 | 22,374 | 93,313 |
| 1979 | 2,970 | 65,779 | 22,070 | 90,819 |
| 1980 | 1,606 | 62,154 | 21,750 | 85,510 |

Note: Ice-bunkered cars refer to those cars equipped with ice bunkers and designed primarily for use of chunk ice (Association of American Railroads mechanical designation RS). Insulated cars refer to bunkerless refrigerator cars with insulation on the sides, roof, and floor, but no cooling system (AAR mechanical designations RB-RBL-RBH-RBLH). Mechanical refrigerated cars have apparatus for furnishing protection against heat and/or cold (AAR mechanical designations RP and RPL). The total column is the sum of the previous three car columns.

Association of American Railroads, Car Service Division.

The number of refrigerated trailers owned, leased, and/or controlled by Class I railroads as of January 1 each year from 1972 to 1980 is shown in table 6. Trailers owned, leased, and/or controlled by Fruit Grower's Express and Pacific Fruit Grower's Express are not included.

Table 6--Refrigerated trailers owned, leased, or controlled by railroads, January 1, 1982-1980

| Year | Refrigerated trailers | Index |
|---|---|---|
| 1972 | 9,141 | 1.00 |
| 1973 | 9,194 | 1.01 |
| 1974 | 8,481 | .93 |
| 1975 | 6,565 | .72 |
| 1976 | 4,431 | .48 |
| 1977 | 2,809 | .31 |
| 1978 | 2,441 | .27 |
| 1979 | 1,776 | .19 |
| 1980 | 1,094 | .12 |

Association of American Railroads, Car Service Division.

The in-service flatcars available for TOFC use are shown by the AAR on January 1, 1972 through 1980 as follows:

Table 7--In-service flatcars for TOFC use, January 1, 1972-80

| Year | Railroad-owned | Privately owned | Total |
|---|---|---|---|
| 1972 | 7,886 | 26,596 | 34,482 |
| 1973 | 8,397 | 28,245 | 36,642 |
| 1974 | 10,618 | 30,362 | 40,980 |
| 1975 | 6,918 | 38,460 | 45,378 |
| 1976 | 6,677 | 39,548 | 46,225 |
| 1977 | 5,885 | 39,140 | 45,025 |
| 1978 | 5,819 | 39,864 | 45,683 |
| 1979 | 7,106 | 41,430 | 48,536 |
| 1980 | 7,955 | 44,765 | 52,720 |

Association of American Railroads, Car Service Division.

For 1975, the AAR figures indicate that a drop in railroad-owned flatcars was accompanied by a sharp increase in the privately owned total. This increase was partially the result of a portion of the railroad fleet being transferred to the

private fleet column. 9/ The railroad fleet continued to decline through 1978, until the trend reversed and the railroads began adding more TOFC/COFC flatcars to their fleet. Since the privately owned total has shown a very significant increase throughout the same period, flatcars available for TOFC/COFC use have increased significantly. Whether this trend will continue is debatable.

To summarize, the supply and availability of insulated and mechanical refrigerated cars suitable for produce movements is diminishing, the trend is definitely away from refrigerated-trailer ownership by the railroads, and the supply of flatcars available for TOFC/COFC use has increased significantly in recent years. Thus, any proposed shipping program for the Florida producers would appear to need to be based on Plan III TOFC.

New Equipment and Concepts

As figures from Railway Age in table 8 indicate, trailers and containers loaded in intermodal service, both refrigerated and

Table 8--Trailers and containers loaded in TOFC services, 1972-79 1/

| Year | Total Movement | Index (1972=100) |
|---|---|---|
| 1972 | 2,366,978 | 100 |
| 1973 | 2,178,328 | 115 |
| 1974 | 2,722,454 | 115 |
| 1975 | 2,210,935 | 93 |
| 1976 | 2,505,673 | 106 |
| 1977 | 2,799,639 | 118 |
| 1978 | 3,177,291 | 134 |
| 1979 | 3,199,946 | 135 |

1/ Figures do not include empty trailers or containers originated that moved on revenue charges, including those which, under tariff, had been assessed revenue charges for the loaded and empty return movement. Movement totals refer to all trailers and containers loaded in piggyback service, whether dry or refrigerated.

Railway Age, October 27, 1980, and AAR, Car Service Division

9/ A change in internal accounting methods in the AAR Car Service Division switched a group of Trailer Train flatcars from the railroad-owned category to the privately owned category in 1975.

general freight, have been increasing significantly during the past several years. Along with this increase in intermodal traffic has developed a demand for equipment which will allow intermodal users to capture the cost efficiencies of a transportation mode that theoretically combines the best features of both rail and highway transportation. Although manufacturers of loading and unloading equipment have been active in research and development, much innovative work in intermodal transportation is being done in TOFC railcar design.

The new concepts in railcar design can be grouped into three basic categories, according to the extent the new design varies from the traditional rail flatcar used for TOFC/COFC services. First, some manufacturers like Budd, Youngstown Steel, and Pullman Standard are developing long, low profile, and sometimes articulated flatcars, to allow for the handling of 45-foot trailers or the handling of regular height trailers in low clearance areas. Although modified to provide the height and length operating advantages, these flatcars still retain a traditional design.

A more radical departure from traditional design is the skeletonized, articulated equipment of the Santa Fe Ten Pack and the ITEL Corporation that deletes much of the bed of the traditional flatcar. By providing only a low profile chassis to support the piggyback trailers, the design emphasis is on a reduced rail flatcar tare weight, which should translate into lower operating costs and fuel savings for the railroad.

An even more pronounced design departure is BiModal's Roadrailer, which deletes the railcar altogether and relies on a built-in set of rail wheels for rail travel and rubber tires for highway use. Like the Santa Fe Ten Pack, Roadrailer claims impressive energy savings through a significant reduction in intermodal equipment tare weight. The specialized nature of both the Ten Pack and Roadrailer prevent their use in conjunction with more traditional railroad equipment.

**Impact of Rail Deregulation**

To understand the impact of the exemption from rail regulation of fruits and vegetables, we must first examine the shipping environment prior to the exemption action. As recently as 1950, the dominant mode in the transportation of fresh fruits and vegetables was the railroad. 10/ However, several factors

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10/ In 1950, nearly three fourths of all fresh fruit and vegetable shipments were carried by railroads. Volume 5, "Fresh Fruit and Vegetable Transportation Services and Costs: Truck and Rail," A Long Term Study of Produce Transportation prepared for U.S. Department of Transportation and National Bureau of Standards by Manalytics Inc., December 1977, p.2.

combined to allow trucking an inroad into the movement of perishables: the Interstate Highway System was developed and other arterial roads were improved, truck operating expenses were low because of inexpensive fuel and low interest rates, and fresh fruits and vegetables were exempt from regulation when they moved in trucks but not when they moved by rail. Truckers also gave careful attention to maintaining appropriate temperatures at all times and could provide part load deliveries. Consequently, the rail share of produce movement gradually declined until a low point of less than 10 percent was reached in 1979, at table 9 illustrates. 11/

Table 9--Modal share of fruit and vegetable movement, 1975-79

| Year | Rail and truck | Rail | Rail share 1/ |
|---|---|---|---|
| | ------- Million cwt ------- | | -- Percent -- |
| 1975 | 517 | 109 | 21 |
| 1976 | 552 | 95 | 17 |
| 1977 | 535 | 79 | 15 |
| 1978 | 428 | 48 | 11 |
| 1979 | 435 | 42 | 10 |

1/ Indicates rail movement as a percentage of total movement as represented by rail and truck (air and domestic boat movement assumed insignificant).

Exempt Rail Transportation of Fresh Fruits and Vegetables -- Initial Impacts, Manalytics, Inc., p. 14, and USDA, Fresh Fruit and Vegetable Shipments, 1975-79, FVUS-7.

Noting that the rail share of perishables movement had declined to 10 percent or less, on May 28, 1979, the Interstate Commerce Commission (ICC) relinquished its economic jurisdiction over rail traffic in certain commodities, including fresh fruits and vegetables. In the first major study done for the ICC on the impacts of the exemption on rail transportation of

11/ See USDA, Fresh Fruit and Vegetable Shipments, 1979, FVUS-7, where domestic rail shipments throughout the U.S. are given as 41,919 (1000 cwt) and total domestic shipments are given as 435,356 (1000 cwt).

fresh fruits and vegetables, a San Francisco consulting firm, Manalytics Inc., indicated that, in general terms, rail service and rail volume have improved since the exemption. 12/ Railcar and piggyback service, in terms of transit time and reliability, were found to have improved significantly since the exemption, especially in the corridors where carriers had been running expedited trains. Railcar volume also improved significantly in 1979 over the same period in 1978. The exemption allowed the railroads rate freedom and the study indicates that railroads have varied their rates according to demand as reflected by competing truck rates. However, the authors acknowledged that many of these developments could not be attributed directly to the rate and service freedom granted by the exemption since much of the increased activity, especially the use of volume rates and Plan III TOFC operations, would have been possible under regulation. Instead, the authors thought that the real impact of the exemption was the changed psychological climate in rail transportation of produce that created a more favorable environment for investment without regulatory intermediation. 13/

In summary, the produce exemption removed common carrier responsibilities from the railroads and encouraged them to abandon their stand-by-carrier status that meant they were used only when trucks could not handle the volume. Since the railroads appear not willing to make large equipment investments alone, many analysts believe that third party involvement, such as shipping associations through Plan III TOFC, will be necessary if shippers are to benefit from the deregulation of fruits and vegetables.

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12/ See Exempt Rail Transportation of Fresh Fruits and Vegetables -- Initial Impacts, prepared for Office of Policy and Analysis, Interstate Commerce Commission by Manalytics, Inc., March 1980, p. 41, in which railcar traffic in exempt perishables is claimed to have increased substantially in the months after the exemption over the same period in 1978.

13/ Ibid., p. 89

## Section 2
## A Transportation and Handling Alternative—TOFC

Preliminary investigation of the feasibility of shipping alternatives including refrigerated railcar, TOFC, truck-boat arrangements, and the new transportation concepts described above led to the conclusion that a TOFC program is most likely to be feasible for the Florida produce shippers. Consequently, the focus of the remainder of this study for the Florida producers will be on the economic feasibility of the substitution of a TOFC shipping plan for a portion of their present shipping program which consists almost entirely of truck transportation.

While there are several rail TOFC plans available to shippers, Plan III was selected for analysis. Under this plan, the railroad provides only the flatcars and the shippers provide the trailers and the origin and destination pickup and delivery services. The railroads encourage the use of Plan III TOFC and appear reluctant to make the equipment investments required of other TOFC plans.

Shippers wishing to use Plan III service can provide trailers from their own fleet, obtain them from a leasing company, contract for the service or, in some instances if they are available, lease them from the railroad on a per-trip basis. Some of the advantages and disadvantages of Plan III TOFC follow.

**Advantages**

-- Shipper control over the supply of equipment

-- Control over the maintenance program

-- Trailers designed and built to shipper's specifications such as reverse air flow, high cube, and unitized loading capabilities.

**Disadvantages**

-- Shipper committed to capital outlay or long-term lease

-- Difficult to negotiate satisfactory contracts with railroads

-- Shipper responsible for return of trailers, loaded or empty

-- Difficult to arrange for timely unloading of trailers on fronthaul and return haul

-- Shipper responsible for maintenance programs

-- Need for professional management of trailer fleet

-- Need for expeditors and other specialized personnel to obtain best utilization of trailers.

DISADVANTAGES

A TOFC program more nearly approximates the present and future needs of both shippers and receivers than any other service offered by the railroads. Shippers and receivers desire fast and frequent service with the flexibility of multiple pickups at origin to assemble mixed loads of produce. These two advantages, plus the smaller trailer loads of TOFC as compared with railcars, illustrate the inherent benefits of a TOFC shipping program over the traditional rail alternative of mechanical refrigerated cars. Although the railroads will have to place greater emphasis on TOFC operations if they want to regain their market share of produce movement, the railroads do not appear interested in making the necessary investment in trailers to meet the demands of shippers interested in TOFC service and have actually been liquidating their present trailer fleets. For this and other reasons, Plan III is the most feasible TOFC plan to evaluate and discuss as an alternative shipping program for the Florida fruit and vegetable producers.

## Section 3
## Service and Cost Comparisons: Truck and Plan III TOFC

In this section, Plan III TOFC is evaluated as a shipping alternative to truck transportation for Florida producers in terms of service and cost for selected market areas.

### Present Trucking System

Shipments of citrus and produce from Florida have traditionally been made by standard semitrailer trucks utilizing insulated vans and nose-mounted refrigeration units. Nationwide, this type of transportation has approximately a 90-percent market share of all intercity fresh fruit and vegetable traffic; for Florida, the share is 99 percent.

Since the interstate trucking of unmanufactured agricultural commodities is exempt from economic regulation, no operating authority from the Interstate Commerce Commission is required, and no rate tariffs must be filed by fresh fruit and vegetable truckers. 14/ Consequently, the produce trucker has operated in essentially an unregulated economic environment, except for safety requirements and hours of operation, in which individual rates are largely negotiated between shipper and trucker and are influenced by seasonal supply and demand. Obtaining information about an unregulated market is difficult due to the absence of reporting requirements; consequently, rate information must be gathered by a survey-interview method. The next two sections will deal with trucking rates to selected market areas, which are shipping costs to the Florida producers, and truck costs to the selected market areas, which refer to the actual costs of operation to the trucker.

### Truck Rates to Market Areas

The "Fruit and Vegetable Truck Rate Report" of USDA's Agricultural Marketing Service (AMS) gives truck rates for produce shipments in truck load volumes to a number of destinations. The rates for the preceding week are collected each Tuesday during the shipping season from fruit and vegetable shippers and truck brokers. Assuming the rate ranges in the report are representative of actual shipping charges by truckers during the shipping season, we used these rates to establish seasonal shipping costs to Florida producers for movement of their product to market by truck. Although the rate report provided Florida truckload rates for a number of different fruits and vegetables, we used the citrus rate for our cost comparison with TOFC. Since trucks rates for citrus are usually lower than for celery, corn, tomatoes, and other vegetables, a TOFC shipping program which proves cost competitive with truck

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14/ After the Motor Carrier Act of 1980, a motor carrier may now transport regulated commodities without affecting the unregulated status of exempt commodities hauled in the same load, See 49 U.S.C. 10528. Mixed loads of regulated and unregulated property.

transportation for citrus should be even more attractive cost-wise for the vegetables.

Although the rate report provides rates to only two of the seven market destinations for which we wished to evaluate TOFC cost and service, trucking rates for all seven markets were estimated by the application of rate differentials to the rates gained from the AMS report. The rate differentials for each market destination were obtained from truck brokers and shippers who indicated an amount per carton above or below the reported rate needed to service each market destination.

Where shippers and truck brokers reported that rates to separate markets were very similar throughout the shipping season, the market destinations were grouped together. For instance, rates to New York and Chicago from Florida reportedly were very similar and consequently those markets were grouped together. The rate differential from the base rate and the seasonal rate average for the five grouped market destinations are shown in table 10.

Table 10--Grouping of seven market destinations, rate differentials, and seasonal rate average

| Group | Rate differential 1/ | Rate average over season |
|---|---|---|
| | Per carton | Dollars |
| I: New York and Chicago | (base rate) | 1,300.98 |
| II: Washington and Baltimore | -10 cents | 1,200.98 |
| III: Boston | +15 cents | 1,450.98 |
| IV: Cincinnati | -15 cents | 1,150.98 |
| V: Philadelphia | -5 cents | 1,250.98 |

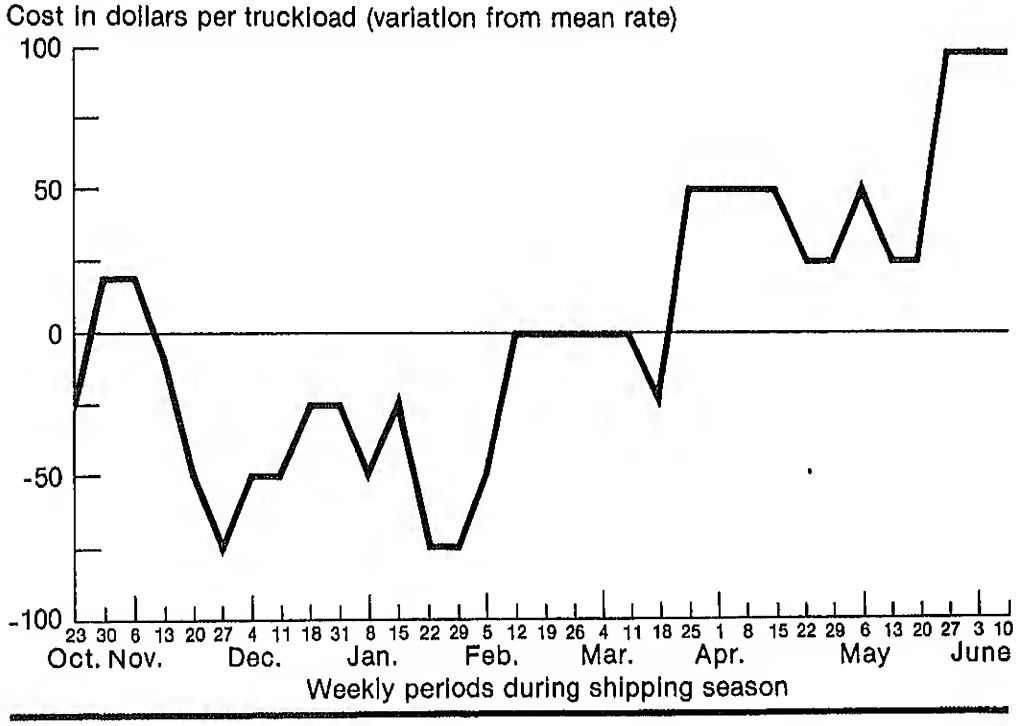
1/ Assumes 1,000 cartons per truckload

Note: The column "Rate average over season" is the average rate per truckload over 33 weeks from October 23, 1979 to June 10, 1980, which approximates the normal Florida shipping season. Rate information from the Fruit and Vegetable Truck Rate Report for the first 13 weeks in the 1980 shipping season indicates rates have not increased significantly: average rate to New York and Chicago during the first 13 weeks in the 1979-80 shipping season was $1,264.04 and average rate for the same destinations for the first 13 weeks in the 1980-81 season was $1,268.96 (although as the appendix tables 8-12 indicate, the weekly rate ranges were greater).

Trucking rates for fruit and vegetable movement from Florida are highly variable throughout the shipping season. The shipping season in Florida begins in the fall and fruit and vegetable shipments increase gradually to a high point during the months of April and May. Thereafter, shipments decline rapidly as production dwindles during the summer. Indicative of the supply-demand influences in the highly competitive produce trucking industry, rates appear to have a positive relationship with production, i.e., as production in Florida increases, so does demand for trucks, and rates increase correspondingly. Rate variability above and below the average rate for the shipping season is shown in figure 2. For actual rate ranges by week in the 1979-80 shipping season, see appendix tables 8 through 12.

Figure 2

**Rate Variability for Five Rate Regions, 1979-1980 Shipping Season**




## Truck Costs to Market Areas

In contrast to trucking rates, which reflect short-term economic supply and demand conditions, a more accurate predictor of the long-term ability of trucks to service the various market areas from Florida is trucking costs. Trucking costs are

important in an analysis of the ability of trucks to accommodate the future transportation demands of Florida fruit and vegetable producers. However, trucking costs cannot be used to estimate rates at a particular point in time since rates reflect both supply (cost) and demand conditions. The costs of trucking that are relevant in the determination of rates from day to day are those out-of-pocket costs that are incurred only if the truck is operated. Over a long period of time, rates must average out to a level equal to or greater than full average costs allocated to the traffic to which the rates apply.

The produce industry of Florida has a demand for transportation services that varies widely during the shipping season. The trucking industry adjusts to meet these variable demands in several ways. During slack seasons, some truckers may move their operations to serve other origin points. Some of the truckers hauling goods into or toward Florida may discontinue their practice of unloading and then deadheading to Florida produce shipping areas to pick up outbound loads. Some truckers may decide to leave the business...at least, until the traffic picks up again.

There is little question that the Florida produce industry benefits from the flexible nature of the trucking industry and its ability to meet Florida's shipping needs. However, at some times during the shipping season, the capacity of the trucking industry may not be great enough and truck shortages may occur, which can cause marketing problems for produce shippers who must move large quantities of their highly perishable product. Also, shortages will lead to rate increases, if the shortages are not just spot shortages.

With specific knowledge concerning backhaul mileages and revenues, Florida produce shippers may gain some indication of the long run rates that must prevail in their traffic from the truck cost analysis in table 11. Theoretically, the reason for estimating cost per mile for a trucker is to infer the average rate (revenue) per mile needed to cover costs. In the long run, no trucker can survive financially when revenue per mile is less than cost per mile.

Without the specific knowledge on backhaul mileages and revenues, only limited inferences can be drawn concerning the adequacy of rates. The difficulty with attempting to determine the adequacy of prevailing rates in covering costs on a one way haul, for instance from Florida to New York, is that the trucker may not try to cover all the costs of that movement with revenue from that movement. Instead, some of the fronthaul costs may be covered by backhaul revenues, or vice versa.

If one assumes that each movement is self-supporting, that all costs are directly covered by revenues from that movement, then one can infer the revenue needed to cover costs. For example, on the northbound fronthaul to New York from Florida, the fronthaul trip cost (1,081 miles times $1.24/mile) of $1,340.44 must be matched by fronthaul revenues of $1,340.44. On the other hand, if one assumes that some "cross-subsidization" takes place, i.e., part of one movement's costs are covered by the other movement's revenues, one cannot infer the amount of one-way revenue needed to cover costs unless one knows what revenues accrue from traffic moving the other direction. About the best that can be done in estimating the long-term viability of a truck route is to determine total movement costs, including both fronthaul and backhaul costs, and then determine if total movement revenues cover those costs. Otherwise, the inference of the adequacy of a rate to cover the costs of a particular one-way movement is hazardous when "cross-subsidization" of movements is ignored.

The truck cost analysis in table 11 was developed from "Owner-Operator Costs of Hauling Fresh Fruits and Vegetables in Refrigerated Trucks", ESCS-82, USDA, and "Fruit and Vegetable Truck Cost Report", a USDA periodical. In the USDA truck cost report, truck cost per vehicle mile is estimated from cost components based on a September 1979 survey of independent truckers. Those cost components were then updated to a January 1981 basis with price indices and other data from the Bureau of Labor Statistics and the Interstate Commerce Commission. Since the USDA truck cost report uses operating assumptions appropriate for a cross-counry driving team, the costing analysis was adjusted to the specific Florida operating situation. Accordingly, two pickups at origin and two deliveries at destination with a 1-day delay for loaded backhauls, and an average one-way trip length of 1,000 miles with 43 round trips per year, were used to estimate total annual mileage of 92,500 for the single driver (for more specificity on truck costing, see appendix table 14).

Service to Market Areas

The minimal acceptable level of service for delivery of fresh fruits and vegetable is considerably higher than for most for-hire trucking. Fresh fruits and vegetable require monitoring in transit since they can deteriorate quickly and customers will refuse to purchase produce that is not of the highest quality or that wich has lost "eye appeal." Interviews with shippers and receivers revealed that the service record of the trucking industry in recent years has been excellent; in fact, most receivers feel that the truck service record in the produce industry is the critical standard other modes of transportation must match if they want to gain additional produce hauling business.

Table 11--Owner-operator truck cost analysis of fruit and vegetable movement from Florida

| Cost component | Cost per year | Cost per mile 1/ |
|---|---|---|
| | Dollars | cents |
| Interest on equipment: | | |
| Tractor interest | 8,453.21 | 9.14 |
| Trailer interest | 4,004.15 | 4.33 |
| Management and overhead: | | |
| Office rental allowance | 942.15 | 1.02 |
| Bookkeeping fees | 677.10 | .73 |
| Legal fees | 348.30 | .38 |
| Telephone | 317.70 | .34 |
| Travel | 411.12 | .44 |
| Office supplies | 125.62 | .14 |
| Dues and charities | 180.03 | .19 |
| Federal use tax | 354.02 | .38 |
| Other taxes | 116.10 | 4.67 |
| Miscellaneous | 845.08 | .91 |
| Insurance on equipment | 7,443.10 | 8.05 |
| Licenses and permits | 2,232.78 | 2.41 |
| Depreciation expense: | | |
| Tractor depreciation | 8,445.25 | 9.13 |
| Trailer depreciation | 3,135.75 | 3.39 |
| Driver cost: | | |
| Wages | 16,901.60 | 18.27 |
| Social Security | 1,369,03 | 1.48 |
| Worker's Comp. Insurance | 1,994.39 | 2.16 |
| Health insurance | 479.64 | .52 |
| Subsistence | 2,806.46 | 3.03 |
| Tractor fuel | 27,086.41 | 29.28 |
| Maintenance: | | |
| Shop wages | 6,223.38 | 6.73 |
| Shop supplies | 372.98 | .40 |
| Parts | 774.63 | .84 |
| Grease and oil | 906.23 | .98 |
| Overhaul expense | 6,486.00 | 7.01 |
| Tires | 3,650.19 | 3.95 |
| Miscellaneous | | |
| Refrigeration fuel | 3,200.50 | 3.46 |
| Unloading fees | 2,150.00 | 2.32 |
| Market fees | 645.00 | .70 |
| Scale fees | 215.00 | .23 |
| Other miscellaneous | 1,310.00 | 1.42 |
| Total truck cost | 114,602.90 | 123.89 |

1/ Assumes an annual mileage of 92,500; see appendix table 14.

While fast transit times are important, most receivers placed greater emphasis on reliability and predictability in arrival times of produce in good marketable condition. Truck transportation has traditionally been not only the fastest mode from the Florida area to the major markets, but also the most reliable and predictable in terms of arrival time. Truckers have also offered multistop pickups to assemble mixed loads and multiple stops for deliveries, an important advantage considering the high percentage of such loads coming out of Florida. The demonstrated service advantage of truck transportation to Florida shippers in terms of (1) fast delivery times, (2) good reliability and predictability of delivery time, and (3) ability to provide multistop pickups and deliveries provides tough standards that any alternative transportation and shipping program must meet if it is to gain much traffic.

## Proposed Plan III TOFC Program

In this section, the proposed Plan III TOFC program is evaluated as a shipping alternative for Florida shippers by the criteria of cost and service, as was done with truck transportation in the previous section.

### Costs to Market Areas

In evaluating TOFC costs to the selected market areas, the major cost components of a single TOFC movement from the Orlando TOFC ramp at Taft, Florida, to the destination ramp were determined in order to obtain a total TOFC cost per trip, which was then compared to the per trip truck rates described earlier. Critical to an accurate total TOFC cost per trip is a precise identification of each individual cost associated with the movement, and of the operating assumptions under which each cost component is derived.

Initially, we assumed that the refrigerated van trailers would have to be leased by the shipping organization since (1) purchasing trailers involves a long-term financial commitment in which the shippers might not want to become involved, and (2)

the individual cost components involved in the Plan III TOF movement.

Rail Cost -- The largest cost component of this Plan III TOF program will be the cost of rail service to transport the trailer from the origin ramp in Florida to the destination ramp. Actual cost of the rail services will be the rate tha the railroads quote the shippers. In the new nonregulated e vironment, rates will largely be a result of negotiations be tween the shippers and the railroad based on volume commit- ments by the shippers. While rates may represent actual rai costs to the shippers in the short run, a better indication rail costs in the long run is economic costing, since rates quoted for the present may not be indicative of the economic cost of providing the service over a long period of time. C sequently, the rail cost component of total TOFC costs was estimated by use of the Interstate Commerce Commission Rail Form A economic costing approach. Operating information for this type of costing, such as a train makeups, crew changes, train miles, and operating times, was provided by cooperatin railroads. Estimated variable rail costs were based on ramp- to-ramp service of two trailers per flatcar, assuming a loade fronthaul and an empty return. When possible, individual cos information from participating railroads was substituted for regional averages (See appendix tables 15-18 and the explana- tory notes). Table 12 illustrates the calculation of TOFC loading weight for each market area:

In this study rail costs were calculated for market destina- tions by way of one of four destination TOFC ramps from the Orlando producing area. The four TOFC unloading ramps were i Alexandria, Philadelphia, Chicago, and Cincinnati. The pri- mary considerations in determining the destination ramp for costing purposes were the size of the market, accessibility b single-line rail service, and the railroad's desire to serve particular market area. For instance, only market destina- tions to which single-line rail service was available were used on the assumption that prompt dependable service would b easier to obtain from one railroad than from several. Also, the huge New York/Newark market would benefit from service vi the closest possible TOFC ramp. Because of the numerous height constraints along the Northeast corridor from Washing- ton, D.C., to New York, TOFC service in the past had to termi- nate at Potomac Yards in Alexandria. However, low profile flatcars could be used to extend rail haul as far north as Philadelphia. From Philadelphia, the TOFC trailers would then be drayed to the Boston, New York, and Philadelphia areas. A third consideration in determing the destination ramp for costing purposes was the railroad's desire to serve particular market area; with a Plan III TOFC shipping program,

Table 12--Calculation of TOFC loading weight for movement into seven market areas

| Market area | Load limit 1/ | Tare weight 3/ | Legal load | Actual load |
|---|---|---|---|---|
| | | Pounds | | |
| Washington | 79,800 2/ | 31,895 | 47,905 | 47,000 |
| Baltimore | 79,800 | 31,895 | 47,905 | 47,000 |
| Philadelphia | 80,000 | 31,895 | 48,105 | 48,000 |
| New York | 80,000 | 31,895 | 48,105 | 48,000 |
| Boston | 80,000 | 31,895 | 48,105 | 48,000 |
| Chicago | 73,280 | 31,895 | 41,385 | 41,000 |
| Cincinnati | 80,000 | 31,895 | 48,105 | 48,000 |

1/ Load limit refers to the most restrictive or lowest load limit of any State through which the load must be drayed to reach the destination market.

2/ Assumes the major market terminals in Maryland must be served from Potomac Yards in Virginia (79,800).

3/ Tare weight is the net weight of the trailer, full tank of diesel fuel for refrigerator unit, driver, tractor, and tractor fuel. Any reduction in tare weight of tractor-trailer combination will allow a corresponding increase in TOFC loading weight.

railroad cooperation and assistance in service considerations is a virtual necessity.

Orlando Drayage -- Assuming that the shipping organization would have to obtain drayage service from its members' packing houses to the TOFC ramp, cost estimates were obtained from several local drayage firms for the round-trip trailer movements to Orlando from selected areas within a 35-mile radius of Orlando. In the calculation of total TOFC cost, the lowest cost estimate for each cost component was used, on the assumption that this cost most accurately reflected the cost for prospective TOFC shippers. Accordingly, for the Orlando drayage, the low estimate of $63.06 was used. This is for drop and pick service from selected areas within about a 35-mile radius of Orlando. For specific information concerning drayage rates for 35 towns around the Orlando area to the Taft ramp, see appendix table 13.

Destination Drayage --Cost estimates for destination drayage are for drop and pick service from the TOFC ramp at the destination to the major fruit and vegetable receivers in the market area. Several private drayage firms servicing each destination were interviewed and the lowest cost estimate for the drayage service was used. Cost for service to individual receivers may vary from the given cost estimate depending on proximity to TOFC ramp. Also, some major receivers may provide drayage with their own tractors.

Trailer Lease -- Operating a Plan III TOFC program requires the operator or shipper to obtain a fleet of trailers of the type, size, and number sufficient to provide the needed service to individual members. Although there are several different financing plans available, leasing is likely to be the most attractive method for a shipping entrant into Plan III TOFC in the position of the Florida producers to acquire trailers. Accordingly, 15 firms who have been associated with leasing refrigerated trailers for TOFC purposes were interviewed. Several of the firms indicated that they were not now leasing trailers for TOFC use but might if a large demand arose. Ten of the fifteen firms interviewed provided leasing estimates for trailers having the given specifications. The low leasing-cost estimate of $14.90 per day received from a national trailer leasing company in December 1980 was used in the analysis. Leasing rates varied a great deal among companies, depending on each individual company's experience and amount of business in the trailer leasing field. Prospective entrants into TOFC shipping should be cautioned against undue reliance on the leasing figures contained in this section; the above-quoted leasing rates were obtained during late 1980 and early 1981, a period in which volatile interest rates discount any long-term predictive value of the lease rates.

Maintenance -- Operating a piggyback fleet will result in two types of maintenance costs: trailer maintenance costs and refrigerator maintenance costs. Since piggyback vans are pulled over a relatively small mileage per year as compared wiht over-the-road vans, trailer maintenance costs should not be significant. Accordingly, most leasing companies will assume normal use and tire wear and tear under their leasing contract

indicated that the prevailing market rate for contracted refrigerator maintenance is about $100 per month.

Insurance -- A shipping organization with leased trailers needs to have protection against three basic types of losses: (1) cargo damage, (2) physical damage to the trailer, and (3) liability from operation of the trailer.

A shipping organization must obtain insurance to cover the loss or damage of members' produce while in the organization's leased trailers. Since fruit and vegetable producers have a large cargo investment in each trailer which leaves their loading dock, they require over-the-road truckers to have cargo insurance and would naturally require the same protection in a TOFC shipping program. According to insurance agencies, insurance of piggyback fleets is a wide open field where rates are largely negotiated based on the insured's operating characteristics and the insurer's experience in damage claims. Nevertheless, the agencies indicated a floater policy would be needed to cover cargo loss, and basic cargo protection could be provided for about 20¢ per $100 value per movement. This rate is highly variable depending upon the individual operating characteristics of the insured, the deductible of the policy, and the subrogation rights the insurance company would have against the drayage firms and the railroad.

The standard trailer-leasing contract will require liability insurance for personal injury, liability insurance for property damage, and comprehensive insurance for damage to the trailer in which the lessor will require to be designated as the loss-payee.

Since the trailer in transit is beyond the care and control of the shipping organization, the drayage companies and the railroads would be expected to cover liability to the shipping organization from their handling of the trailer on their own policy. Consequently, liability protection for the shipper should be provided under each carrier's individual policy and no actual cost for liability insurance should accrue to the shipping organization. However, shipping organizations generally carry damage insurance of their leased trailers amounting to about 3 percent of trailer value per year. Assuming a new trailer value of $28,000, this would amount to about $70 per month. This cost may be lower depending on the responsibility drayage companies and the railroads are willing to assume under their contracts with the shippers. Many of these matters will require an attorney's attention, especially when the contractual conditions are negotiated.

Pretrip Expense -- A proper maintenance program will include a pretrip inspection and service by qualified service personnel before each trailer is loaded. Rates for pre-tripping trailers were obtained from major refrigerator service companies around the Orlando areas. Several service companies quoted rates from Orlando: $23.50 plus $0.40/mile, or $20.00 mileage plus $20.00/hour for the first 1.5 hours. A national service organization, for cost purposes, quoted a flat rate of $34.78 per trailer.

Fuel Expenses -- While the trailer is en route and the refrigeration unit is cooling or warming the load (refrigeration unit is the term which refers to a unit having both heating and cooling capabilities), the shipping organization will incur fuel expense. This fuel expense will vary according to (1) rate of fuel consumption of refrigeration unit, (2) refrigeration time, and (3) cost of fuel. With the new energy-saving refrigeration units on the leased trailers, engineers project fuel consumption to be approximately 0.7 to 1 gallon/hour during heavy precooling and 0.3 to 0.5 gallon/hour during in-transit refrigeration. For a refrigeration time, hours were allocated for the heavy precooling and drayage in Florida, line-haul, transit on rail, and drayage at destination, and added to obtain a total refrigeration time in hours. Each produce load was assumed to require maximum cooling/hearing -- a conservative estimate likely to be on the high side of the actual cooling/heating required for most loads during the year. Actual heating/cooling requirements vary according to whether the load was precooled, the ambient temperature, and the construction and insulation properties of the refrigerated trailer. For the diesel fuel cost, the March 23, 1980, ICC estimate of $1.347 per gallon was used. Under these assumption, table 13 on the next page indicates the fuel expense to each market destination from the Orlando producing area.

| Fixed Costs | Dollars |
|---|---|
| Trailer lease per month | 453.52 |
| Refrigerator maintenance per month | 100.00 |
| Trailer insurance (damage) per month | 70.00 |
| Subtotal per month | 623.52 |
| 10 percent estimated bad order cost per month | 62.35 |
| Subtotal per month | 685.87 |
| Estimated administration cost @ 10% per month | 68.59 |
| Total per month | 754.46 |
| Average fixed cost per day | 24.79 |

Table 13--Refrigeration expense to each market area

| Destination ramp | Market area | Refrig. time 1/ | Fuel expense 2/ |
|---|---|---|---|
| | | -Hours- | -Dollars- |
| Potomac Yards | Washington | 40 | 32.33 |
| Potomac Yards | Baltimore | 41 | 33.01 |
| Philadelphia | Philadelphia | 62 | 47.15 |
| Philadelphia | New York | 65 | 49.17 |
| Philadelphia | Boston | 70 | 52.54 |
| Chicago | Chicago | 66 | 49.84 |
| Cincinnati | Cincinnati | 57 | 43.78 |

1/ Refrigeration time refers to total time in hours for heating/cooling for each market area, 4 hours were allocated for heavy precooling during drayage and 4 hours for heavy precooling during the initial portion of rail transit. Hours in rail transit during light cooling were estimated from train schedules and between 8 to 16 hours were allocated for refrigeration time during drayage depending on the market destination. The fuel consumption rate for heavy precooling and light maintenance cooling was estimated as 1 gallon per hour and 0.5 gallon per hour respectively.

2/ Fuel expense is the total of all hours of refrigeration multiplied by an appropriate fuel consumption rate and then times the ICC estimated diesel fuel price of $1.347 per gallon.

Rail costs for both loaded direction and empty return, Orlando drayage, cargo insurance, pretrip expense, and fuel expense were included in the variable cost category for costs which are incurred per trailer movement. For total TOFC cost per movement, the fixed trailer cost must be allocated to each trailer movement and then added to the variable cost per movement. The fixed trailer cost was allocated on a per-trip basis by multiplying the daily fixed cost by the estimated number of days in a trailer round trip or the turnaround time. The cost then obtained represents a total TOFC cost with a 100 percent empty return. To the extent that backhauls are obtained, the shipping organization will receive compensation which will be credited against the total round-trip TOFC movement. Thus, any backhaul revenue will reduce the cost of the round trip, although it may also result in a slower turnaround time and increase fixed costs allocated to each trip. Total TOFC costs for six levels of empty return were calculated for comparative purposes.

Total TOFC cost and operating information is given in table 14. Total TOFC costs were calculated for six different levels of empty return, on the assumption that turnaround time would increase as the level of empty return for the trailer fleet diminished and backhauls were obtained. Estimating the number of additional days added to the trailer turnaround for empty return to account for delays for backhauls is difficult at best. Our formula shows the effect of the added turnaround time on total TOFC cost, and shippers can insert their own increased turnaround figures as desired. Two extra days at the market area and three extra days at Florida were estimated as the increase in the normal turnaround time for a full shift from 100 percent empty return to 0 percent empty return for the trailer fleet. Shipper were assumed to allow use of their leased trailers free of charge on the backhaul, provided the backhaul shippers pay their own rail charges. The following formula shows the calculation of total TOFC cost for any percentage of empty return under the specified assumptions:

$$TCER\% = (TC100ER\%) - (1-\frac{ER\%}{100}) [(RCER) - (ATT)(DAFC)]$$

where:

TCER% = Total TOFC cost at given percentage of empty return
TC100ER% = Total TOFC cost at 100 percent empty return
ER% = Empty return percentage
RCER% = Rail cost for empty return
ATT = Additional turnaround time over 100 percent ER turnaround time to account for full backhaul or percent ER
DAFC = Daily allocated fixed cost

Table 14--Total TOFC cost and operating information per trailer from Orlando

| Cost component | Wash. | Balt. | Phil. | N.Y. | Boston | Chicago | Cinci. |
|---|---|---|---|---|---|---|---|
| | Dollars | | | | | | |
| Variable cost: | | | | | | | |
| Fronthaul rail cost | 439.58 | 439.58 | 529.93 | 529.93 | 529.93 | 513.40 | 433.39 |
| Backhaul rail cost | 328.06 | 328.06 | 396.82 | 396.82 | 396.82 | 382.93 | 314.59 |
| Orlando drayage | 63.06 | 63.06 | 63.06 | 63.06 | 63.06 | 63.06 | 63.06 |
| Destination drayage | 127.78 | 167.39 | 96.00 | 190.40 | 525.00 | 85.00 | 53.00 |
| Cargo insurance | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| Pretrip expense | 34.78 | 34.78 | 34.78 | 34.78 | 34.78 | 34.78 | 34.78 |
| Fuel expense | 32.33 | 32.00 | 47.15 | 49.17 | 52.53 | 49.84 | 43.78 |
| Total variable cost | 1,045.59 | 1,085.87 | 1,187.74 | 1,284.16 | 1,622.12 | 1,149.01 | 962.60 |
| Allocated fixed cost | 198.32 | 223.11 | 247.90 | 297.48 | 347.06 | 347.06 | 198.32 |
| Total cost: 100% ER | 1,243.91 | 1,308.98 | 1,435.64 | 1,581.64 | 1,969.18 | 1,496.07 | 1,160.92 |
| 80% ER | 1,203.09 | 1,268.16 | 1,381.07 | 1,527.07 | 1,914.61 | 1,444.27 | 1,122.79 |
| 60% ER | 1,162.27 | 1,227.34 | 1,326.49 | 1,472.49 | 1,860.03 | 1,392.48 | 1,084.66 |
| 40% ER | 1,121.44 | 1,186.51 | 1,271.92 | 1,417.92 | 1,805.46 | 1,340.68 | 1,046.54 |
| 20% ER | 1,080.62 | 1,145.69 | 1,217.34 | 1,363.34 | 1,750.88 | 1,288.89 | 1,008.41 |
| 0% ER | 1,039.81 | 1,104.87 | 1,162.77 | 1,308.77 | 1,696.31 | 1,247.09 | 970.28 |
| Operating information: | | | | | | | |
| Average truck rate | 1,200.98 | 1,200.98 | 1,250.98 | 1,300.98 | 1,450.98 | 1,300.98 | 1,150.98 |
| TOFC turnaround in days | 8 | 9 | 10 | 12 | 14 | 14 | 8 |
| Truck mileage | 846 | 883 | 977 | 1,081 | 1,279 | 1,104 | 867 |
| TOFC load in cwt | 470 | 470 | 480 | 480 | 480 | 410 | 480 |

Notes: Rail backhaul cost calculated on a 100 percent empty return basis. Allocated fixed cost calculated by multiplying turnaround in days (ER) times daily fixed cost of $24.79. Average truck rate represents the average of truck rates observed for all 33 weeks in the shipping season as collected by USDA and published in Fruit and Vegetable Truck Rate Report. Actual average of all rates paid will be slightly higher since the higher rates occurred during the heavy shipping months.

## Service to Market Areas

For an evaluation of the service characteristics of the proposed Plan III TOFC shipping program, the railroads have indicated certain service levels as reliable to the market areas. Basically, the railroads have indicated that they can provide dependable second morning service to the Alexandria ramp for Washington and Baltimore, third morning service to Chicago, and either second or third morning service to Cincinnati and to the Philadelphia ramp for New York, Philadelphia, and Boston.

## Conclusions

In terms of service comparisons of truck and Plan III TOFC, if the railroads can provide the service that they have guaranteed, TOFC would be highly competitive with truck transportation in satisfying the service criteria and requirements of shippers and receivers.

In terms of cost comparisons, whether Plan III TOFC is a viable alternative depends upon assumptions concerning turnaround time and backhauls available from the market destinations. With the turnaround times used in table 15, there is a great deal of difference among the seven market destinations when total TOFC cost per trailer is compared with the average truck rate per trailer for each level of ER (empty return). For two market destinations, Cincinnati and Washington, the TOFC shipping program is economically feasible (less costly) than last year's average truck rate at all but 100 percent of empty return. Baltimore is feasible at three of the six levels of empty return. Philadelphia and Chicago are economically feasible at two levels of empty return, while New York and Boston were not found economically feasible at any levels of empty return.

The high TOFC costs for New York and Boston are directly the result of the extremely high drayage expense needed to pull the TOFC trailer from the Philadelphia TOFC ramp to these market areas. Note that New York and Boston require $314.00 and $525.00 drayage expense respectively, while drayage expenses for Cincinnati ($53.00) and Chicago ($85.00) are much lower, and the total TOFC costs to these areas are reduced accordingly. The real cost savings in TOFC movements are in line-haul transportation; when short haul drayage distances increase on either the origin or destination ends, the line-haul cost savings are used directly to subsidize the short-haul drayage expense. As a result, as drayage distance as a percentage of line-haul distance increases, the TOFC movement loses much of its inherent cost efficiency. Nevertheless, in addition to service and cost comparisons to each market destination, consideration must also be given to each market's size. The northeast area (Philadelphis, New York, and Boston) accepts a

huge amount of Florida produce each year. The development of a shipping alternative that is less costly on a per-shipment basis than present truck transportation would yield a greater total savings to the northeast market than to a smaller market like Cincinnati.

# Section 4
# The Plan III TOFC Program: Entry Considerations

Even though Plan III TOFC may provide a feasible shipping alternative for the Florida producers in terms of both cost and service, a number of entry considerations must be addressed if Florida producers want to implement this type of shipping program. First, the shippers would encounter serious difficulties in establishing the TOFC program without some type of formal organization under which individual member shippers would combine their volumes and act together to reduce risk and improve utilization of equipment. After forming an organization, the next step for the producers would be to obtain experienced management to operate the shipping program on a daily basis and also to advise on the many start-up considerations. With the help of their professional management, the shippers next would need to decide the more fundamental questions of equipment acquisition and operation, such as the size of the trailer fleet, financing arrangements, types and sizes of trailers, maintenance of trailer and refrigerator unit, and insurance needs. After the organization has been formed, management hired, and equipment and services obtained, an ongoing entry consideration of the shippers would be the establishment of an operating procedure. This procedure would deal with problems of allocation of trailers, division of costs and returns to individual shipper members, and establishment of time limits for trailer use by members.

## Organizational Alternatives

In order to achieve any substantial improvement in their ability to market their products, the Florida shippers must operate collectively and pool their volumes and resources. A formal organization of shippers is vital to the success of the proposed Plan III TOFC program, since railroads are reluctant to guarantee the service needed to make TOFC feasible without a firm volume commitment over a period of time. As a practical matter, most shippers do not want to make this commitment alone and would much rather join an organization in which they can participate in TOFC shipping with limited risk.

4. Act as a farmer cooperative to establish contract carrier arrangements.

A formal organization of shippers who wish to ship in interstate commerce must retain a knowledgeable attorney who is familiar with the variety of regulatory statutes that are available to prospective shippers. Before the variety of regulatory exemptions for shipping organizations and cooperatives and their applicability to the proposed Plan III TOFC shipping program are discussed, a recent ICC tendency to limit economic regulation of the shipment of fresh fruits and vegetables by TOFC will be examined.

On May 28, 1979, the ICC exempted rail carriage of most fruits and vegetables from economic regulation. On March 23, 1981, an ICC decision took effect exempting from ICC rate regulation rail and truck service provided by a railroad in connection with trailer-on-flatcar and container-on-flatcar operations, and the agency is currently considering expanding the exemption to trucking firms not owned by the railroads. 15/ In view of the fruit and vegetable exemption, the Florida shippers would face no regulation on their fronthaul movement since they normally would be shipping an exempt commodity. But until TOFC deregulation is expanded to nonrailroad-owned trucking firms, as the ICC is expected to do, the complete TOFC movement will not be free of the regulatory constraint. With this background, the current organizational alternatives that would allow the Florida shippers the greatest degree of regulatory freedom in operating a Plan III TOFC shipping program will be examined. A more extensive treatment can be found in the supplementary note in the appendix.

The Cooperative Exemption

A motor vehicle controlled and operated by a cooperative association is exempted under 49 U.S.C. 10526 (a) (5) from regulatory jurisdiction by the Interstate Commerce Commission. As long as the shipper's association satisfies the requirements for designation as an agricultural cooperative pursuant to 12 U.S.C 1141j, transportation of member freight is beyond jurisdiction of the ICC. However, once a properly formed agricultural cooperative begins hauling freight for a nonmember that is not a farmer, cooperative association, federation, or the U.S. Government, it faces certain regulatory requirements in order to keep the exempt status before the ICC. First, the

15/ See 49 CFR Parts 1039, 1090 and 1300 (Ex Parte No. 230 (Sub-5)) Improvement of TOFC/COFC Regulation, Federal Register, Vol. 46, No. 39, Friday, February 27, 1981, Rules and Regulations, pp. 14348 - 14352. Also, Journal of Commerce, March 23, 1981, p.1.

transportation for the nonmembers must be incidental to the primary transportation operation and necessary for its effective performance. Second, the tonnage transported may not exceed 25 percent of the total transportation of the cooperative between those places. Third, the transportation of freight for nonmembers can only be provided after the ICC has been notified. As an overall requirement, the tonnage transported for all nonmembers by the cooperative cannot exceed the total tonnage transported between those places for the cooperative and its members.

Of primary importance in the consideration of the cooperative exemption is that it specifically refers to motor carriers and therefore has limited application to the formation of an organization to ship by Plan III TOFC. If the exemption were used, a properly organized cooperative trucking association of Florida shippers would be exempt from regulation on its fronthaul since the transportation would normally be for cooperative members. However, since backhauls for the trucks will normally be obtained from nonmembers, the cooperative would face significant regulatory requirements. Most significant of these regulatory requirements is the restriction which limits nonmember, nonexempt volume to only 25 percent -- a limitation which would seriously affect the economics of a cooperatively organized trucking venture.

### The Freight Forwarder Exemptions

Although 49 U.S.C. 10562 specifically deals with the regulation of freight forwarders, it also contains two sections which exempt certain organizations from regulation.

The first exemption from Subchapter IV freight forwarder regulation is contained in 49 U.S.C. 10562(1), which exempts an agricultural cooperative, as defined in 12 U.S.C. 1141j, from ICC jurisdiction and regulation. An organization eligible for the cooperative exemption is required by 12 U.S.C. 1141j to contain members who are all farmers.

nature of the association allows its unregulated status. A number of other principles, as elaborated by the Commission and the courts, further define the unregulated shipper's association under 49 U.S.C. 10562(3) as compared with the regulated freight forwarder: (1) the association must be under the control and direction of the association members, (2) the essential risks and burdens of the enterprise must be borne by the association, (3) the association must be operated for the benefit of members only, and (4) the association must be operated on a nonprofit basis.

The 49 U.S.C 10562(3) and (4) exemption appears to fit the needs of the Florida grower shipper group since it allows the flexibility of nonfarmer membership while retaining the exempt regulatory status.

## Managing a TOFC Program

A TOFC program requires management that has the necessary expertise to ensure efficient, low-cost service to the members of the shipping organization. Since a Plan III TOFC program requires that the shipper provide trailers and trailer maintenance, more emphasis must be placed on management decisions as compared with a TOFC program in which the shippers assume less responsibility, such as in Plan II or Plan II 1/2. Also, another factor influencing the management expertise needed is the type of maintenance program, whether it is a full-service lease with maintenance program included, or one set up and operated by shippers.

A decision by the shippers to purchase or lease trailers and operate them under the proposed Plan III TOFC shipping program would also require them to obtain a specialized management and operating staff. The principal types of specialized staff members would be as follows:

-- Management well versed in rail and piggback operation.

-- Freight expeditors to ensure fast turnaround of trailers.

-- Freight solicitors in the market areas to obtain backhaul tonnage.

-- Tracers to track and account for the location and movement of trailers.

-- Maintenance personnel, if a self-operated maintenance program is selected.

-- Administrative and operating personnel as required for day-to-day operations.

**Acquisition of Trailers**

Operating a Plan III piggyback program requires the shippers to obtain a fleet of trailers of the optimum type, size, number, and equipped with the proper refrigeration unit to provide consistent and dependable service. The shipper must determine the number of trailers required and comparative costs of the alternative methods of trailer lease or purchase before a specific size and type of trailer for the piggyback program can be recommended.

Size of Fleet

The Florida producing areas, as was mentioned earlier, has a very uneven outbound shipping flow, which presents problems in determining the size of fleet for the Plan III TOFC shipping program. During the 8 heavy shipping months of November through June, 94 percent of the total shipping (in terms of cwts shipped in 1979) of domestic fruit and vegetable shipments takes place; during the 9 months of October through June, 98 percent of the total domestic shipments takes place (see appendix table 7). Due to this extreme variation in shipping flow, most of the trailers leased to handle even a small portion of shipping during the peak period would be idle during the slow summer months. As a result, it is recommended that the Florida shippers, if they intend to lease their own trailers, lease only the number for which they can find alternative uses in the slow summer shipping period.

The key to finding alternative uses for the leased trailers, as far as the Florida shippers are concerned, is to identify those shipping areas which have complementary shipping flows of products which can be handled in the leased piggyback trailers. Once these areas are identified, an equipment exchange agreement could be worked out with these other producers in which Florida producers could use the trailers during their heavy shipping months and shuttle them elsewhere during the slack summer period. Produce shippers in California and possibly Texas might prove ideal candidates for some sort of equipment exchange agreement (see figure 3). Such an arrangement would help assure trailer availability during the peak periods and at the same time provide a means of covering trailer costs during the balance of the year.

Options for Obtaining Trailers

There are three primary options available for obtaining a fleet of TOFC trailers:

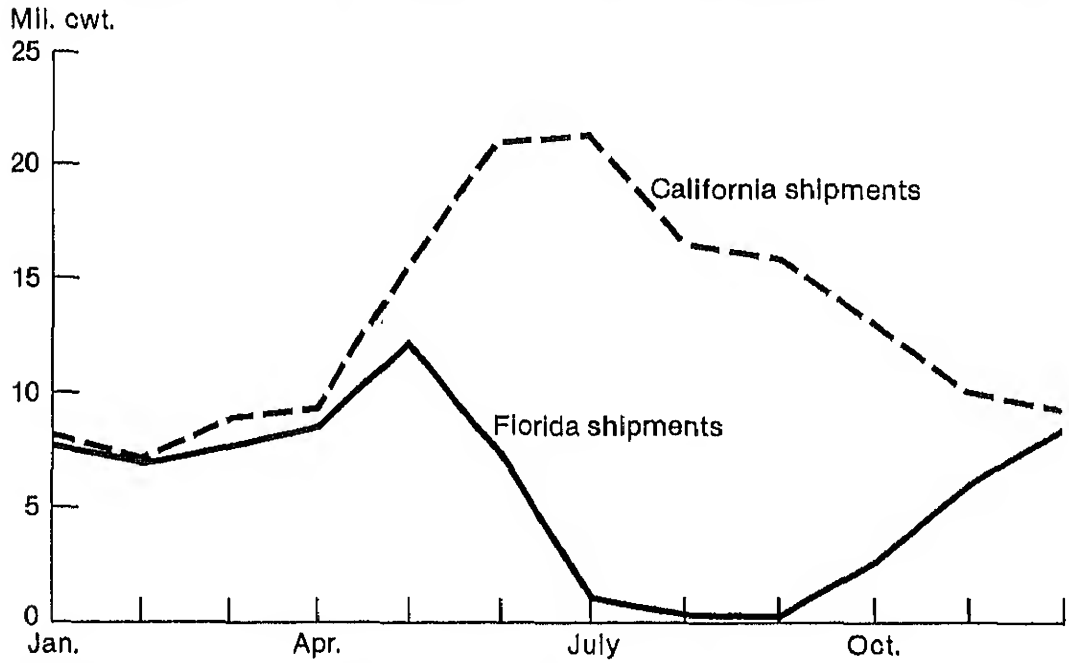
1. Contract or negotiated agreement -- This would involve a working arrangement with an organization or contractor, such as a trucking company, cooperative, railroad, or supplier of railroad equipment, who would be willing to purchase or lease trailers for an assured return on its investment. Advantages of this type of arrangement would be the built-in professional management and established

trailer-tracking system of the contractor. It would also relieve the shippers of the need for expeditors and freight solicitors to arrange backhauls and rapid return of the trailers. In addition, it would eliminate the need for large capital investment.

The question of whether the Florida shippers should contract for TOFC service with an established piggyback company that has the equipment and service support, or purchase or lease the quipment and provide the service support themselves, depends on the shippers' preference for externalized versus internalized TOFC operations. The shippers can easily externalize their TOFC shipping operations by contracting with an established company who could provide them trailers, drayage, insurance, etc., at a rate per trailer for a one-way haul, in which case the shippers would not have the backhaul concern. The disadvantage of externalizing or contracting many of the aspects of the TOFC program would be the added expense of providing contractors with a reasonable return on their investments. However, in the long run this may be less expensive than

Figure 3

**California's and Florida's Fresh Fruit and Vegetable Shipments, 1979**




Source: USDA, *Fresh Fruit and Vegetable Shipments*, 1979, FVUS-7

it would at first appear, since a good established tracking system and a professional management team could reduce equipment requirements to a minimum. In any event, since this study focuses on the cost of internalizing TOFC operations for the Florida shippers, even if the decision is made for contracting many of the TOFC operations, the study will provide a guide to the reasonableness of contract rates for the Florida shippers.

2. Direct purchase -- Assuming all economics of scale are equal for volume purchasing, and ample financing is available at reasonable rates, it is usually better from an economic standpoint to buy trailers than to lease them. The lessor must include a profit margin on lease rates and that profit margin is an additional cost that the lessee would not incur if it owned rather than leased the trailers. Some disadvantages would include (1) obtaining and tieing up the capital needed for trailer purchase, (2) the possibility of equipment obsolescence, and (3) responsibility for major repairs and maintenance.

3. Leasing -- Any organization must watch its cash position and leasing is one way to preserve cash for other revenue-generating activities. Some of the other advantages of leasing include:

   a. Investment tax credit (ITC) for fruit and vegetable marketing -- cooperatives do not normally generate "net income"; therefore, they are unable to fully utilize the 10 percent ITC. It can be arranged for the leasing company to take the ITC, then pass it on in the form of lower lease rates.

   b. Budgeting strategy is simpler in that cash flow is fixed, with no abrupt replacement costs to ruin projected budgets.

   c. Nationwide maintenance programs are offered by some leasing companies that provide repair and/or replacement services in all major U.S. cities.

   d. Volume purchasing and disposal of used equipment can usually be handled better through a leasing company that is set up to take advantage of market changes.

Present Value Analysis of Options

A common approach which perhaps best presents the comparative costs of leasing versus purchasing is the present value of cash flow analysis. Since cash outlays for each investment alternative occur at different times, and since a dollar to be paid at some future date is not equivalent to a dollar paid

today, the concept of present value is used to discount these future outlays in dollars into current dollars at present value to be used for comparing the financing and investment alternatives. The following hypothetical example illustrates the use of present value analysis in the evaluation of three types of financing arrangements: a purchase using equity capital, a purchase using debt capital, and a lease arrangement. For the example, we will assume a $28,000 trailer investment, an 8-year projected investment life, a 20 percent salvage value, and a 16 percent interest rate on debt. Cash receipts and expenses are assumed equivalent, and the costs of maintenance, repair, insurance, etc., are assumed to be identical under all three alternatives. In addition, we assume that the lessor will pass the investment credit on to the lessee-shipping organization and that the savings to the shippers through the investment tax credit will be present under all three financing alternatives. The discount rate used in this type of investment analysis has a very significant influence on the present value. Consequently, in deriving and using the present value procedure, one should always recognize the importance of correctly estimating the proper discount rate to accurately reflect the cost of capital or the cost of funds for financing purposes. For this example, a discount rate of 14 percent was used, which, as the prevailing interest rate on United States Treasury Bills, should provide an indication of the opportunity cost of capital for the trailer investment. Tables 15, 16, and 17 present a present value analysis for each of the three different financing alternatives.

The result of the present value outflow analysis of these different financing alternatives shows leasing to be the least costly, equity-financing next, and debt-financing the most expensive. While this presentation illustrates the type of investment analysis used in the typical lease or purchase decision, conclusions cannot be drawn as to which would be the most attractive financing alternative for the Florida shippers in the absence of more specific information. For this analysis, the lowest estimated leasing rate and purchase price were used for the specified refrigerated trailer as obtained from a national trailer firm. Through negotiation, a group of shippers may be able to develop an arrangement under which differing lease costs and purchase prices may change the present value cost of the financing alternatives and show a different financing alternative as more attractive.

Present value analysis of the lease-purchase decision shows the strictly quantitative side of the decison. Other factors, such as impact of the financing alternative on the organization's cash flow, debt-equity ratio, and operating flexibility must be incorporated into the analysis. By using this

Table 15--Ownership: Present value cash flow utilizing equity

| Item | Present value | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
|---|---|---|---|---|---|---|---|---|---|
| | ---------- | ---------- | ---------- | ---------- | Dollars | ---------- | ---------- | ---------- | ---------- |
| Purchase | -28,000 | | | | | | | | |
| Salvage | | | | | | | | | +5,600 |
| 14% PV discount | | | | | | | | | .3506 |
| PV of annual cash outflow | -28,000 | | | | | | | | +1,963 |
| Total cash outlflow | | | | | | | | | -22,400 |
| PV of total cash outflow | | | | | | | | | -26,037 |

Note: Investment = $28,000 estimated purchase price
8-year projected life with a 20 percent residual salvage value
Tax exempt cooperative
All funds paid at end of year
Outright purchase utilizing equity capital -- no financing

Table 16--Ownership: Present value cash flow utilizing debt

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
|---|---|---|---|---|---|---|---|---|
| | ---------- | ---------- | ---------- | Dollars | ---------- | ---------- | ---------- | ---------- |
| Principal retirement | -3,500 | -3,500 | -3,500 | -3,500 | -3,500 | -3,500 | -3,500 | -3,500 |
| Interest | -4,480 | -3,920 | -3,360 | -2,280 | -2,240 | -1,680 | -1,120 | - 560 |
| Salvage value | | | | | | | | +5,600 |
| Annual cash outflow | -7,980 | -7,420 | -6,860 | -6,300 | -5,740 | -5,180 | -4,620 | +1,540 |
| 14% PV discount | .8772 | .7695 | .6750 | .5921 | .5194 | .4556 | .3996 | .3506 |
| PV of annual cash outflow | -7,000 | -5,710 | -4,631 | -3,730 | -2,981 | -2,360 | -1,846 | + 540 |
| Total cash outflow | | | | | | | | -42,560 |
| PV of cash outflow | | | | | | | | -27,718 |

Note: Purchase financed at 16 percent
Principal amoritized at 12.5 percent annually

Table 17--Lease: Present value cash flow analysis

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
|---|---|---|---|---|---|---|---|---|
| | | | | | Dollars | | | |
| Annual cash outflow | -5,442 | -5,442 | -5,442 | -5,442 | -5,442 | -5,442 | -5,442 | +5,442 |
| 14% PV discount | .8772 | .7695 | .6750 | .5921 | .5194 | .4556 | .3996 | .3506 |
| PV of annual cash outflow | -4,774 | -4,188 | -3,674 | -3,222 | -2,827 | -2,479 | -2,175 | +1,908 |
| Total cash outflow | | | | | | | | -43,536 |
| PV of cash outflow | | | | | | | | -25,247 |

Note: 8-year lease
Lease rate (shown as annual cash outflow) obtained from national leasing firm based on a $28,000 trailer purchase price. Actual rate used is $14.90 per day. Annual cash outflow = $14.90/day x 365.25 days.
All funds paid or received at end of year

procedure to analyze the various financing alternatives and by inserting their own costs into the analysis when possible, the Florida shippers should develop an accurate picture of both the quantitative and qualitative advantages and disadvantages of each financing alternative.

Types and Sizes of Trailers

Height and length are the two primary considerations in selecting the size of a refrigerated trailer for TOFC use. If shipping charges are per trailer load, the rate per carton will be less on the front haul for larger trailers, and such trailers will be attractive for use in backhauls. Thus, the objective in designing trailers for TOFC use is to maximize the inside cube within the physical restrictions of the railroad flatcar.

Height is important in the design of the trailer, and will become even more so in the future as shippers and receivers take advantage of unit loading and unloading with the 40 x 48 inch (1000mm x 1200mm) pallets and slipsheets. To load and unload mechanically, a trailer height of 13 feet 6 inches is desirable. Anything less than this will cut down on the available cubic volume of the trailer and also subject the roof to possible damage from the masts of the lift trucks while loading and unloading. This will also require trailer doors that open flush with the inside width and height of the door opening.

Unfortunately, many of the railroad rights of way were not designed with sufficient overhead clearances to handle normal height TOFC shipments. A 13 1/2-foot trailer placed on a three-foot flatcar on the Conrail System between Washington, D.C., and New York City will encounter 66 height restrictions, including the Baltimore tunnel. Consequently, any proposed TOFC program will need to use carefully selected routings to avoid low overpasses. Some height restrictions can be bypassed by rerouting, but this may not always be a satisfactory solution as it can add miles to the route and, in some cases, days to delivery and turnaround times.

Our next serious concern was the length of the trailer. As mentioned earlier, a high cube trailer than can be mechanically unloaded and loaded is required. A 40-foot trailer, for example, can take only 18 of the commonly used 40 - by - 48 - inch pallet units if loaded mechanically with a straight-in pattern, while also requiring bracing or blocking by hand. A 41-foot 4-inch trailer, on the other hand, provides enough extra length to take a full 20-pallet load and does not require hand blocking. This extra cube capacity is desirable if the trailers are to be loaded with a backhaul. Freight forwarders and other potential users of trailers stressed that rental agreements and freight tariffs favor heavier loads. Therefore, the 40-foot refrigerated trailers with their lower cubes are used only when none of the higher cube general purpose trailers are available.

In the past there have been a number of different approaches taken to circumvent the length limitation of the standard 89-foot rail flatcar. Some of these include modifying the flatcars and relocating the stanchions to accept one 40-foot trailer and one 45-foot trailer; another variation has been using belly-mount refrigeration units on the trailer.

The problem in using a 40-foot trailer in combination with a 45-foot trailer is that it is not always possible to have the exact number of loaded 40-foot trailers available to match with the 45-foot trailers. In addition, specially converted flatcars are required in order to use this shipping arrangement of different length trailers. When working with highly perishable products, this would not be a practical operation.

New refrigeration systems are now on the market that take up much less outside space than older models, allow the placing of two trailers on a standard flatcar, and still provide an inside loading measurement of about 40 feet 4 inches. Although this trailer may accept 20 of the 40 - by - 48 - inch

condensor section is belly-mounted, while the evaporator is inside the trailer and takes up space. Most of the disadvantages are not a significant drawback to using the system on a new TOFC fleet; in the case of the damage potential, this is not considered serious in a TOFC program because only short pickup and delivery hauls take place over the road.

Refrigeration Equipment

Two types of trailer refrigeration systems will be considered in this study: the standard airflow or top air delivery system, and the bottom air delivery system (reverse airflow). The reverse airflow system is recommended.

With the standard airflow, cold air is blown over the top of the load, cooling it while circulating downward. After reaching the floor, the return air passes the temprature sensor on its way back to the cooling unit. During the operating cycle, if the temperature sensor on the air return indicates the load should be cooled down, the compressor starts the cooling cycle. Often, the top half of the load may be cooled below the specified temperature, even to the point of freezing, while the warmer bottom half of the load would cause the air return sensor to continue the cooling cycle. By the time the air return sensor indicates a temperature low enought to shut down the cooling cycle, excessive cooling of the top half of the load may cause the heating cycle to start, causing wide swings in temperature.

With a reverse or bottom airflow system the fan is reversed and the return air comes in from the top of the load past the cooler unit, then past the temperature sensor, and on through the load by way of the floor. Temperature is always measured after the air passes the cooling and heating units and before it reaches the load. By sensing airflow temperature before it reaches the load, the possibility of overcooling (freezing) or overheating is virtually eliminated.

Most conventional refrigerated highway trailers and van containers introduce refrigerated air into the cargo compartment from above the load and distribute it though canvas ceiling ducts. The refrigerated air then flows downward through and around the cargo and returns to the air-handling unit through air channels constructed in the floor. These top-to-bottom air delivery systems also provide frozen loads, which should be loaded in tight blocks, with a peripheral air circulation to remove heat generated from sources other than the product. These heat sources may include: (1) air leakage into the vehicle caused by differences between internal and external air pressures; (2) conduction of heat through the walls, roof, and floor; and (3) heat from the evaporator fan motor. Product respiration heat from nonfrozen loads in top air delivery

systems is removed from the product as the refrigerated air passes through the cargo mass by way of air circulation channels formed by stacking cartons of product in various "air stacking" patterns.

Today's refrigerated vehicles must serve the dual purpose of carrying both frozen and chilled agricultural products. Chilled products may require temperatures ranging from 32° F to above 60° F (0° to 15° C) during transit.

Agricultural products transported at temperatures above their freezing point may contain large quantities of sensible heat and, in addition, actually generate heat during the natural metabolic process of respiration. This heat contained in the pulp of perishable products must be removed from the product to prevent accelerated ripening and internal pulp breakdown so that an acceptable product shelf life remains after arrival at destination markets. This need for a dual temperature range imposes stringent design requirements on both the refrigeration unit and the air distribution system that delivers the refrigerated air to the respiring perishable product. Breakiron describes the interfacing between the load mass of nonfrozen products and the air distribution system provided by the under-the-floor delivery (sometimes referred to as a reverse airflow) when used in a total systems approach. 16/ He takes into consideration unitization methods, product stacking, vehicle size requirements, and product handling.

Studies have been conducted to determine the optimum air distribution system required in transportation vehicles to successfully transport nonfrozen agricultural products in shipments with transit times than may last for up to 3 weeks or longer during export movements. Refrigerated vehicles equipped with different types of forced air, under-the-floor air distribution systems were evaluated in both stationary and transport tests to determine equipment design charateristics that can best provide the proper transport environment for the nonfrozen production. Studies conducted with a lateral, under-the-floor air distribution system show it to be effective in transporting lettuce, carrots, cabbage, and celery in a

16/ Breakiron, P.L. Engineering better interfacing of the load, the transport vehicle, and the refrigeration unit for improved transportation. Proc. Int. Soc. Citriculture, Vol. 1., pp. 283-293, 1977.

tightly stacked load pattern. 17/ In this lateral, under-the-floor system, the cold air was forced laterally down the side walls and under the floor, where it then moved up through the load from the floor to the ceiling. Some extremely sensitive agricultural products require that temperatures be kept within a narrow range or that refrigeration discharge-air temperatures do not fall far below the thermostat set point. This situation is especially critical when the optimum transit temperature requirement of the product is near its freezing point, because relatively small fluctuations of discharge air temperature below the thermostat set point could result in frozen product.

The refrigeration systems tested in van containers and trailers equipped with longitudinal air delivery will control the temperature on the discharge air just before it reaches the cargo. This eliminates "over-cool" often found in other units that control temperature on the return air. In this longitudinal under-the-floor air delivery system, the air is forced under the floor from the front of the trailer to the back where it is then blocked and forced up through the load to the warm air return at the top of the load.

The temperature controls on most new refrigeration units are designed with a capacity modulation system. This system allows freon to move from the compressor to the evaporator coil in varying amounts as required to maintain the desired temperature, rather than the full-on or full-off method. Such a modulation system provides a uniform coil temperature which is reflected in more uniform cargo temperatures.

Refrigeration discharge air and return air temperatures were closely monitored in a van container equipped with longitudinal air delivery during a test shipment. The van container was fully loaded with a tightly stacked cargo of product to determine the range of discharge or temperature fluctuations near the thermostat set point. With the thermostat set on 34° F, the discharge air ranged from 32° to 34° F, while the return air ranged from 34° to 35° F.

During commercial transport tests, the two experimental air distribution systems delivered air uniformly throughout the

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17/ Hinsch, R.T., R.H. Hinds, Jr., and W. F. Goddard, Jr. Lettuce temperatures in a van container with a reverse air-flow circulation system. U.S. Dept. Agri., Market Res. Rpt. 1082, 1977. Steward, J.K. Transit temperatures and quality of fresh vegetables shipped in an experimental and a commercial van container to the Far East. U.S. Dept. Agr., Market Res. Rpt. 1054, 1976.

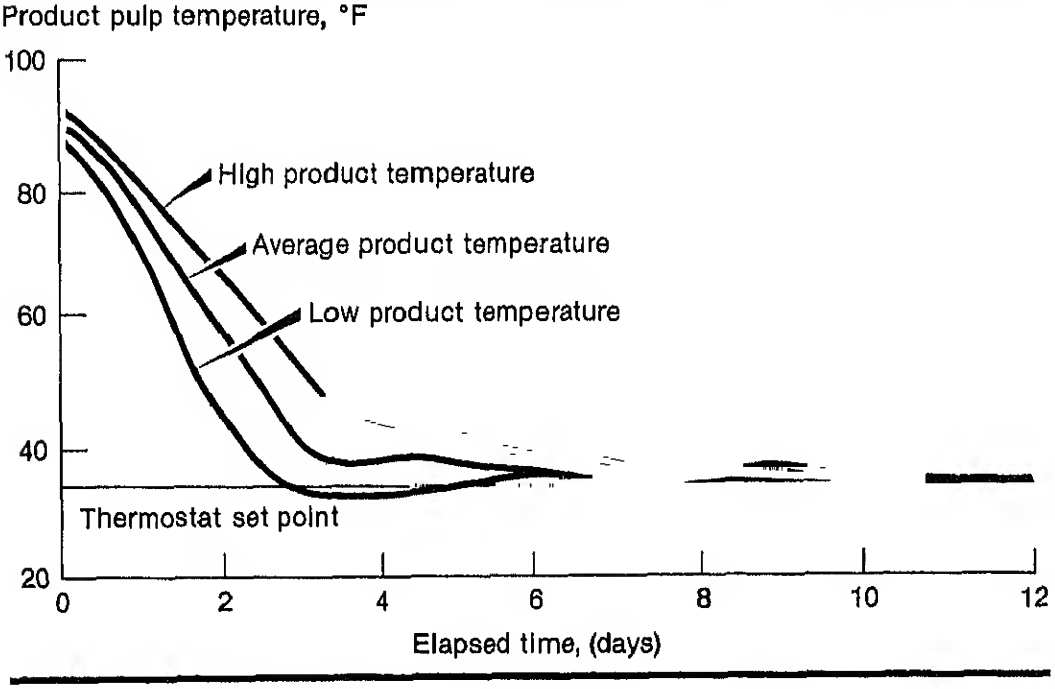
loading space and within the safe range for the commodity transported, regardless of loading pattern used. Both types of forced air systems provided similar results with respect to temperature uniformity and product cooling. The temperature profile graph in figure 4 shows the general pattern of product temperature reduction and maintenance in fully loaded van containers and trailers equipped with the experimental forced air, under-the-floor air-delivery systems during the series of stationary and transport tests. Specific product temperatures and temperature pulldown times are dependent on product temperature at time of loading, refrigeration unit capacity, type of product transported, vehicle coefficient of heat transfer, weather conditions, and other variables.

Recommendations

For best performance in vehicles equipped with under-the-floor air-delivery systems, the cargo should be tight-stacked to completely cover the floor, thus forming a pressurized air plenum under the load. Tight-stacking not only makes better use of available cargo space, but is also easier for workers to load and provides added stacking support for individual cartons. The cartons or boxes should have ventilation bottom

Figure 4

**Typical Temperature Profile of Agricultural Product Transported in Vehicle Equipped with Forced Air, Under-the-Floor Air Delivery System**



holes in the bottom of each carton that match similar holes i the top. When cartons are stacked in register, these holes provide a honeycomb of air circulation channels throughout th load. If such cartons are not used, circulation will be restricted unless a chimney-type or other air-stack loading pattern is provided.

If the product is unitized on slipsheets, the slipsheets should have vent holes that match those in the packages to provide air circulation. Any floor area not covered by cartons or slipsheets should be covered to prevent short-circuiting of air around the load mass and back to the refrigeration unit air return inlet. The USDA experimental van container used in the shipping tests was equipped with the longitudinal, under-the-floor air-delivery system. It was fitted with a flexible sheet of canvas at the rear door that could be used to cover the rear floor and form a pressurized plenum for center-of-load cooling or be removed to allow perimeter circulation for frozen cargo.

General design features that would be desirable in vehicles transporting nonfrozen perishable agricultural products include:

1. A forced air, under-the-floor air distribution system to provide refrigerated air at sufficient static pressure to penetrate the cargo mass of respiring perishable products and provide peripheral air circulation for frozen loads.

2. A solid-state thermostat with dual sensing elements to control discharge-air temperature for chilled cargoes and return-air temperature for frozen cargoes. Refrigeration unit controls should include either a hot gas bypass system, compressor cylinder unloading, or some other method to modulate refrigeration capacity near the thermostat set point.

3. A flat front cargo-retaining bulkhead with no refrigeration unit components protruding into the cargo area.

4. A floor consisting of either T-rails or corrugations deep enough to provide air channels of sufficient cross-sectional area to allow for uniform air delivery to all parts of the cargo mass.

5. Side walls ribbed to provide for perimeter air circulation and to prevent excessive heat transfer between cargo mass and vehicle walls.

6. A fresh-air exchange system to prevent the buildup of undesirable gases of respiration produced by many products during transit.

7. An access port or valve for the introduction of modified atmosphere inside the vehicle for transporting some products. In addition, a tight-fitting plastic curtain around the inside of the rear door is needed to prevent air leaks into the cargo compartment.

8. A method of securing the load at the rear of the vehicle, such as logistic cross bars or a load gate.

**Comparative Trailer Cost**

As was explained earlier, 15 firms that had been active in either leasing or manufacturing refrigerated trailers for TOFC use were surveyed to obtain price quotations on purchasing or leasing trailers. In general, the prices quoted below are given as a range only, since each manufacturer has its own package best suited for the service.

The price of a trailer ranging from 13 to 13 1/2 feet in height and from 40 feet 4 inches to about 42 1/2 feet in inside length will vary from $28,000 to $34,200, depending on the type of refrigeration unit, trailer dimensions, type of floor and lining, and type and amount of insulation. These prices are "ballpark" estimates only. The final firm price probably will be closer to the low end than the high end of the price range, since firm prices cannot be determined in the absence of negotiation. Also, on a fleet size purchase, most leasing firms would offer a lower per trailer price.

Lease costs of trailers ranged from $450 to $625 per month for a net lease (not including maintenance) and from $625 up with a mileage charge and hourly refrigeration charge for a full service lease including maintenance. A great deal of price variance exists between the companies according to each company's experience in piggyback leasing and its scale of operation, i.e., the number of vans it leases per year. As in purchasing a trailer, prices vary greatly in leasing accordingly to trailer specifications.

**Trailer Maintenance**

One of the most important items in any TOFC program for produce is a sound maintenance plan to keep the units running trouble-free. Although the trailer van may require some small maintenance during a lease period, most of the items to be repaired, such as tail lights and mudflaps, will not be significant expenses. These repairs will occur relatively infrequently, since the unit will be involved in over-the-road service a minimum of the time. Tires have to be replaced occasionally, but if the trailer only travels 3,000 or 4,000

miles a year, the expense would occur once in a great many years. Also, many leasing companies will assume normal tire wear and tear as part of their leasing contract with the shi per. One significant damage problem for a presently operati TOFC shipper was damage from ramping/deramping with mechanic forklifts at the TOFC rail yard. Damage and vandalism to TO trailers when out of the care and control of the shipper, or the responsibility of the railroads or drayage firms, should be a topic for discussion at contractual negotiations with these parties. A commitment is needed from all parties in t TOFC operation, including shippers, drayage firms, railroads, and receivers, to eliminate this unnecessary cost. The few items of general trailer maintenance that are necessary can performed by any member of the shipping organization instead of by a contractor.

Refrigerator unit maintenance, however, requires qualified service personnel and probably should be contracted for with major manufacturer or possibly a firm with experience in the field. Performing periodic service checks, calibrating the thermostat, and changing oil and worn belts are the major items which must be performed by qualified service personnel. Thus, until the shippers obtain enough trailers to justify hiring and training their own maintenance staffs, refrigerato maintenance should be contracted.

## Commitments by Parties

Any TOFC shipping program organized by the Florida shippers would require firm commitments by the parties involved to utilize it to the fullest. In terms of the proposed Plan III TOFC shipping program, commitments to utilize the program would be required from shippers, receivers, and railroads.

### Shipper Commitment

The commitment of the shipping organization has already been defined: the organization would have to obtain the piggyback trailers, whether by contract, lease, or purchase, and would have to guarantee a specific level of volume to the railroad to get the required service. In addition to the trailer investment, the organization would also have to cover administration, operation, and finance costs.

To protect such an investment, it would be reasonable to require a commitment from each member of the shipping organization. A commitment by the members could include any or all of the following components:

-- A commitment to share in organizing, patronizing, and financing a shipper-grower controlled group.

-- A minimum guaranteed annual volume based on a fixed amount or a percentage of total volume shipped.

-- Assured regularity of a guaranteed annual volume at daily, weekly, or monthly periods.

-- The right to the program of first refusal on all shipments.

Railroad Commitment

The success of the proposed TOFC program for the Florida shippers depends, to a great extent, on the cost and quality of service provided by the railroads. The railroads' commitment might include any or all of the following components:

-- A service schedule guaranteeing train arrival at destination ramps within a narrow predetermined time range.

-- An agreement on volume rates to relieve shippers from annual volume requirements if the railroad fails to furnish or pull flatcars.

-- A guaranteed contract rate schedule, with provisions for periodic increases to cover costs, that would apply for a sufficient time to permit shipper-growers to recover their investment.

-- A schedule for return of empty trailers to point or origin within a reasonable time range.

Receiver Commitment

Since receivers of Florida fruits and vegetables generally determine how and when shipments move, and pay the freight bill, the cooperation and support of these receivers is vital to the success of any Plan III TOFC program. Support of the program could take the form of the following commitments by the receivers:

-- Agreement to receive a percentage of the total volume by the Plan III TOFC program

-- Contract on an annual basis at a predetermined rate for moving a set volume of produce by the program.

**Potential Problems**

In a complex transportation program such as Plan III TOFC, many problems can arise if firm commitments of the various parties are not obtained or if the parties do not live up to the "spirit" of their obligation to the program. Therefore, several of the problems that must be addressed if a program is implemented are identified.

Backhaul There are two divergent opinions on the necessity of obtaining backhauls for a Plan III TOFC program. While backhauls provide compensation for a return trip which otherwise would be a cost allocated totally to the fronthaul movement, obtaining backhauls and allowing trailers to be used by

another shipper lengthens turnaround time for the trailer. Because certain fixed expenses are incurred by the trailer operator whether the trailer is used or not, this lengthened turnaround time will increase fixed costs allocated to each round-trip movement. Thus, the decision of whether to obtain backhauls depends primarily on whether the backhaul revenues are greater or less than the increased fixed costs per movement that result from the increased turnaround time.

Thus, some shippers involved in Plan III TOFC believe that empty trailers should be returned to the point of origin as quickly as possible without the usual backhaul delays. Other shippers believe it is economically unfeasible to operate a Plan III TOFC program loading only one way. The decision is not an easy one, and depends on a cost/benefit type analysis in which the costs associated with backhaul, such as increased allocated fixed cost per movement from longer trip turnaround as well as maintenance and damage problems resulting from others using shipper trailers, are balanced against the benefits of backhauls in the form of return trip compensation for a cost that otherwise would have to be allocated fully to the front movement.

As a practical matter, other backhaul problems faced by a Plan III shipper are (1) making the necessary contacts and arrangements for backhauls, (2) coping with pilferage, vandalism, equipment damage, cleaning, and other possible cost items associated with backhauls, and (3) getting the trailers unloaded in Florida in a reasonable time. The problems associated with vandalism, pilferage, and equipment damage result because the trailer is beyond the control of the shipper-operator. On the other hand, the railroads tend to give priority status to a loaded trailer over an empty one, particularly when they are short of equipment -- a factor which, in some cases may actually shorten the expected turnaround time on a round-trip movement with a full backhaul.

Turnaround Time Closely related to whether backhauls should be developed is the importance of turnaround time in the cost feasibility of Plan III TOFC. Nowhere is the maxim of "time is money" better illustrated than in the costs associated with increased turnaround time for a TOFC program. Utilization of equipment is the key to profitable TOFC, and now that the shift in TOFC shipping is to Plan III trailers provided by the shippers, the shippers will bear the financial risk and responsibility to keep turnaround time at a minimum and equipment utilized as much as possible.

Other Problems Other potential problems in Plan III TOFC must be recognized. A sound maintenance program is needed to

assure a supply of dependable trailers. Handling of loss and damage claims with Plan III TOFC is more difficult than with over-the-road trucks since the responsibility covering liability, validity, and payment of claims is unclear among the parties involved in this type of shipping operation. There is also a concern that title to the shipment from Florida must remain with the shipper until delivery is accepted by the receiver, since the reciever should not be required to bear the responsibilities of shipment title when the shippers have care and control over the delivery process.

In order to circumvent the seasonality problem, Florida shippers will be able to commit only to the number of trailers for which alternative uses can be found during the slow summer months. If some of the trailers are idle during this time, the feasibility analysis of TOFC vis-a-vis truck would have to be changed to account for the costs associated with the less than optimal utilization.

Appendix table 1--Total unloads and Florida unloads in New York/Newark by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 1,378 | 1,206 | 1,499 | 1,301 | 0.92 | 0.93 |
| Oranges | 868 | 686 | 1,962 | 1,757 | 0.44 | 0.39 |
| Tomatoes | 572 | 405 | 1,205 | 951 | 0.47 | 0.43 |
| Watermelons | 190 | 352 | 442 | 726 | 0.43 | 0.48 |
| Potatoes | 60 | 38 | 4,524 | 3,945 | 0.01 | 0.01 |
| Sweet Corn | 215 | 222 | 346 | 396 | 0.62 | 0.56 |
| Celery | 267 | 276 | 876 | 751 | 0.30 | 0.37 |
| Cabbage | 224 | 254 | 692 | 970 | 0.32 | 0.26 |
| Tangerines | 496 | 349 | 504 | 362 | 0.98 | 0.96 |
| Cucumbers | 230 | 288 | 739 | 709 | 0.31 | 0.41 |
| Other | 1,530 | 1,526 | 18,871 | 17,056 | 0.08 | 0.09 |
| Totals | 6,030 | 5,602 | 31,660 | 28,924 | 0.19 | 0.19 |

For appendix tables 1-7, USDA, Fresh Fruit and Vegetable Unloads, FVUS-4, 1979.

Appendix table 2--Total unloads and florida unloads in Washington/Baltimore by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 254 | 339 | 278 | 362 | 0.91 | 0.94 |
| Oranges | 289 | 296 | 410 | 458 | 0.70 | 0.65 |
| Tomatoes | 222 | 224 | 444 | 467 | 0.50 | 0.48 |
| Watermelons | 173 | 214 | 383 | 431 | 0.45 | 0.50 |
| Potatoes | 160 | 207 | 1,869 | 2,963 | 0.09 | 0.08 |
| Sweet Corn | 130 | 138 | 198 | 219 | 0.66 | 0.63 |
| Celery | 137 | 138 | 273 | 324 | 0.50 | 0.43 |
| Cabbage | 150 | 137 | 344 | 355 | 0.44 | 0.39 |
| Tangerines | 58 | 61 | 64 | 73 | 0.91 | 0.84 |
| Cucumbers | 80 | 108 | 197 | 218 | 0.41 | 0.50 |
| Other | 483 | 495 | 4,712 | 5,730 | 0.10 | 0.09 |
| Totals | 2,136 | 2,357 | 9,172 | 11,330 | 0.23 | 0.21 |

Appendix table 3--Total unloads and Florida unloads in Boston by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 394 | 503 | 427 | 540 | 0.92 | 0.93 |
| Oranges | 166 | 203 | 731 | 858 | 0.23 | 0.24 |
| Tomatoes | 529 | 469 | 937 | 894 | 0.56 | 0.52 |
| Watermelons | 132 | 174 | 381 | 421 | 0.35 | 0.41 |
| Potatoes | 41 | 41 | 2,193 | 2,445 | 0.02 | 0.02 |
| Sweet Corn | 115 | 117 | 230 | 234 | 0.50 | 0.50 |
| Celery | 210 | 244 | 670 | 669 | 0.31 | 0.36 |
| Cabbage | 185 | 129 | 485 | 522 | 0.38 | 0.25 |
| Tangerines | 114 | 119 | 119 | 133 | 0.96 | 0.89 |
| Cucumbers | 131 | 152 | 516 | 503 | 0.25 | 0.30 |
| Other | 544 | 553 | 8,012 | 8,026 | 0.07 | 0.18 |
| Totals | 2,561 | 2,704 | 14,701 | 15,245 | 0.17 | 0.18 |

Appendix table 4--Total unloads and Florida unloads in Cincinnati by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 158 | 156 | 185 | 183 | 0.85 | 0.85 |
| Oranges | 111 | 89 | 232 | 221 | 0.48 | 0.40 |
| Tomatoes | 109 | 82 | 321 | 270 | 0.34 | 0.30 |
| Watermelons | 65 | 82 | 167 | 158 | 0.39 | 0.52 |
| Potatoes | 102 | 86 | 1,716 | 1,561 | 0.06 | 0.06 |
| Sweet Corn | 107 | 105 | 173 | 163 | 0.62 | 0.64 |
| Celery | 53 | 39 | 197 | 164 | 0.27 | 0.24 |
| Cabbage | 71 | 34 | 299 | 292 | 0.24 | 0.12 |
| Tangerines | 45 | 34 | 52 | 45 | 0.86 | 0.76 |
| Cucumbers | 43 | 44 | 137 | 128 | 0.31 | 0.34 |
| Radishes 1/ | 487 | 326 | 496 | 338 | 0.98 | 0.96 |
| Other | 147 | 140 | 3,513 | 3,169 | 0.04 | 0.04 |
| Totals | 1,498 | 1,217 | 7,488 | 6,692 | 0.20 | 0.18 |

1/ Includes 480 (1,000 cwt) in 1979 by TOFC and 315 (1,000 cwt) in 1978 by TOFC.

Appendix table 5--Total unloads and Florida unloads in Chicago by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 248 | 296 | 330 | 431 | 0.75 | 0.69 |
| Oranges | 267 | 247 | 745 | 812 | 0.36 | 0.30 |
| Tomatoes | 267 | 284 | 715 | 792 | 0.37 | 0.36 |
| Watermelons | 186 | 189 | 613 | 568 | 0.30 | 0.33 |
| Potatoes | 47 | 72 | 3,235 | 3,832 | 0.01 | 0.02 |
| Sweet Corn | 152 | 142 | 227 | 199 | 0.67 | 0.71 |
| Celery | 60 | 48 | 402 | 361 | 0.15 | 0.13 |
| Cabbage | 86 | 42 | 471 | 457 | 0.18 | 0.09 |
| Tangerines | 86 | 55 | 116 | 100 | 0.74 | 0.55 |
| Cucumbers | 79 | 108 | 269 | 319 | 0.29 | 0.34 |
| Other | 315 | 204 | 8,455 | 8,631 | 0.04 | 0.02 |
| Totals | 1,973 | 1,829 | 15,578 | 16,502 | 0.12 | 0.11 |

Appendix table 6--Total unloads and Florida unloads in Philadelphia by commodity and year

| Commodity | Florida unloads | | Total unloads | | Market share | |
|---|---|---|---|---|---|---|
| | 1979 | 1978 | 1979 | 1978 | 1979 | 1978 |
| | 1,000 cwt | | | | Percent | |
| Grapefruit | 478 | 527 | 516 | 550 | 0.93 | 0.96 |
| Oranges | 274 | 339 | 760 | 862 | 0.36 | 0.39 |
| Tomatoes | 358 | 336 | 630 | 661 | 0.59 | 0.51 |
| Watermelons | 169 | 147 | 349 | 395 | 0.48 | 0.37 |
| Potatoes | 100 | 64 | 2,186 | 2,330 | 0.05 | 0.03 |
| Sweet Corn | 136 | 140 | 215 | 227 | 0.63 | 0.62 |
| Celery | 147 | 138 | 466 | 472 | 0.32 | 0.29 |
| Cabbage | 161 | 149 | 449 | 483 | 0.36 | 0.31 |
| Tangerines | 157 | 144 | 164 | 168 | 0.96 | 0.86 |
| Cucumbers | 112 | 118 | 342 | 347 | 0.33 | 0.34 |
| Other | 587 | 552 | 7,430 | 8,043 | 0.08 | 0.07 |
| Totals | 2,679 | 2,654 | 13,507 | 14,538 | 0.20 | 0.18 |

Appendix table 7--Domestic fruit and vegetable shipments from Florida by mode, month, and commodity, 1979

| Mode/Commodity | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rail: | | | | | | | | | | | | | |
| Grapefruit | 4 | 1 | - | - | - | - | - | - | - | - | - | 3 | 8 |
| TOFC: | | | | | | | | | | | | | |
| Oranges | - | - | - | - | 8 | - | - | - | - | - | - | - | 8 |
| Potatoes | - | - | - | - | 134 | 116 | - | - | - | - | - | - | 250 |
| Radishes | 60 | 58 | 74 | 88 | 75 | 10 | - | - | - | 24 | 39 | 70 | 498 |
| Tangerines | - | - | - | 1 | 2 | - | - | - | - | - | - | - | 3 |
| Watermelons | - | - | - | - | 21 | 80 | 6 | - | - | - | - | - | 107 |
| Truck: | | | | | | | | | | | | | |
| Grapefruit | 1,559 | 1,610 | 1,795 | 1,359 | 881 | 228 | 21 | 1 | 7 | 1,054 | 1,247 | 1,377 | 11,139 |
| Oranges | 923 | 934 | 1,036 | 1,030 | 1,051 | 585 | 180 | 46 | - | 233 | 1,254 | 1,929 | 9,201 |
| Tomatoes | 982 | 571 | 668 | 1,166 | 2,068 | 418 | 6 | - | - | 75 | 973 | 1,510 | 8,437 |
| Watermelons | - | - | - | 22 | 1,543 | 3,404 | 441 | - | - | - | - | 1 | 5,411 |
| Potatoes | 47 | 173 | 399 | 561 | 2,211 | 1,097 | 1 | - | - | - | - | - | 4,489 |
| Sweet Corn | 129 | 115 | 265 | 732 | 1,157 | 891 | 138 | 1 | 11 | 94 | 167 | 189 | 3,889 |
| Celery | 590 | 567 | 748 | 662 | 718 | 117 | 1 | - | - | - | 77 | 234 | 3,774 |
| Cabbage | 775 | 590 | 590 | 745 | 476 | 17 | 1 | - | - | - | 2 | 169 | 3,365 |
| Tangerines | 383 | 435 | 317 | 68 | 18 | 1 | 4 | 1 | - | 222 | 685 | 888 | 3,022 |
| Cucumbers | 93 | 47 | 75 | 363 | 635 | 72 | 4 | 1 | 2 | 133 | 328 | 189 | 1,942 |
| Other | 2,100 | 1,799 | 1,643 | 1,508 | 1,086 | 458 | 205 | 256 | 197 | 649 | 1,066 | 1,714 | 12,681 |
| Air: | | | | | | | | | | | | | |
| Avocados | - | - | - | - | - | - | - | 1 | - | - | - | - | 1 |
| Strawberries | 11 | 7 | 11 | 11 | 3 | - | - | - | - | - | - | - | 33 |
| Totals | 7,656 | 6,907 | 7,621 | 8,308 | 12,084 | 7,554 | 1,008 | 307 | 217 | 2,484 | 5,838 | 8,274 | 68,258 |

Appendix table 8--Truck rate information on shipping Florida citrus: Orlando to Washington and Baltimore

| Week | Rate range | Rate average |
|---|---|---|
| | Dollars | |
| 10 - 23 - 79 | 1,100 - 1,250 | 1,175.00 |
| - 30 | 1,165 - 1,275 | 1,220.00 |
| 11 - 6 | 1,165 - 1,275 | 1,220.00 |
| - 13 | 1,110 - 1,275 | 1,192.50 |
| - 20 | 1,100 - 1,200 | 1,150.00 |
| - 27 | 1,050 - 1,200 | 1,125.00 |
| 12 - 4 | 1,100 - 1,200 | 1,150.00 |
| - 11 | 1,100 - 1,200 | 1,150.00 |
| - 18 | 1,150 - 1,200 | 1,175.00 |
| - 31 | 1,150 - 1,200 | 1,175.00 |
| 1 - 8 - 80 | 1,100 - 1,200 | 1,150.00 |
| - 15 | 1,050 - 1,200 | 1,125.00 |
| - 22 | 1,050 - 1,200 | 1,125.00 |
| - 29 | 1,050 - 1,200 | 1,125.00 |
| 2 - 5 | 1,050 - 1,250 | 1,150.00 |
| - 12 | 1,150 - 1,250 | 1,200.00 |
| - 19 | 1,150 - 1,250 | 1,200.00 |
| - 26 | 1,150 - 1,250 | 1,200.00 |
| 3 - 4 | 1,150 - 1,250 | 1,200.00 |
| - 11 | 1,150 - 1,250 | 1,200.00 |
| - 18 | 1,100 - 1,250 | 1,175.00 |
| - 25 | 1,150 - 1,350 | 1,250.00 |
| 4 - 1 | 1,150 - 1,350 | 1,250.00 |
| - 8 | 1,150 - 1,350 | 1,250.00 |
| - 15 | 1,150 - 1,250 | 1,250.00 |
| - 22 | 1,150 - 1,300 | 1,225.00 |
| - 29 | 1,150 - 1,300 | 1,225.00 |
| 5 - 6 | 1,150 - 1,350 | 1,250.00 |
| - 13 | 1,150 - 1,300 | 1,225.00 |
| - 20 | 1,150 - 1,300 | 1,225.00 |
| - 27 | 1,250 - 1,350 | 1,300.00 |
| 6 - 3 | 1,250 - 1,350 | 1,300.00 |
| - 10 | 1,250 - 1,350 | 1,300.00 |

Average rate for shipping season: $1,200.98

Washington and Baltimore rate ranges were calculated by multiplying a per box rate differential of $.10 under the Chicago base rate by an estimated 1,000 boxes per truckload, and then subtracting this amount from the Chicago range.

Appendix table 9--Truck rate information on shipping Florida citrus: Orlando to New York, Chicago

| Week | Rate range | Rate average |
|---|---|---|
| | Dollars | |
| 10 - 23 - 79 | 1,200 - 1,350 | 1,275.00 |
| - 30 | 1,265 - 1,375 | 1,320.00 |
| 11 - 6 | 1,265 - 1,375 | 1,320.00 |
| - 13 | 1,210 - 1,375 | 1,292.50 |
| - 20 | 1,200 - 1,300 | 1,250.00 |
| - 27 | 1,150 - 1,300 | 1,225.00 |
| 12 - 4 | 1,200 - 1,300 | 1,250.00 |
| - 11 | 1,200 - 1,300 | 1,250.00 |
| - 18 | 1,250 - 1,300 | 1,275.00 |
| - 31 | 1,250 - 1,300 | 1,275.00 |
| 1 - 8 - 80 | 1,200 - 1,300 | 1,250.00 |
| - 15 | 1,150 - 1,300 | 1,225.00 |
| - 22 | 1,150 - 1,300 | 1,225.00 |
| - 29 | 1,150 - 1,300 | 1,225.00 |
| 2 - 5 | 1,150 - 1,350 | 1,250.00 |
| - 12 | 1,250 - 1,350 | 1,300.00 |
| - 19 | 1,250 - 1,350 | 1,300.00 |
| - 26 | 1,250 - 1,350 | 1,300.00 |
| 3 - 4 | 1,250 - 1,350 | 1,300.00 |
| - 11 | 1,250 - 1,350 | 1,300.00 |
| - 18 | 1,200 - 1,350 | 1,275.00 |
| - 25 | 1,250 - 1,450 | 1,350.00 |
| 4 - 1 | 1,250 - 1,450 | 1,350.00 |
| - 8 | 1,250 - 1,450 | 1,350.00 |
| - 15 | 1,250 - 1,450 | 1,350.00 |
| - 22 | 1,250 - 1,400 | 1,325.00 |
| - 29 | 1,250 - 1,400 | 1,325.00 |
| 5 - 6 | 1,250 - 1,450 | 1,350.00 |
| - 13 | 1,250 - 1,400 | 1,325.00 |
| - 20 | 1,250 - 1,400 | 1,325.00 |
| - 27 | 1,350 - 1,450 | 1,400.00 |
| 6 - 3 | 1,350 - 1,450 | 1,400.00 |
| - 10 | 1,350 - 1,450 | 1,400.00 |

Average rate for shipping season: $1,300.98

Rate ranges were taken from the USDA Fruit and Vegetable Truck Rate Reports for weekly periods during the shipping season. Rates quoted represent rates paid per load by shippers, including truck brokers fees, for shipments in truck load volume to a single destination. Rates are based on the most usual load in 40-ft. trailer from Orlando.

Appendix table 10--Truck rate information on shipping Florida citrus: Orlando to Boston

| Week | Rate range | Rate average |
|---|---|---|
| | Dollars | |
| 10 - 23 - 79 | 1,350 - 1,500 | 1,425.00 |
| - 30 | 1,415 - 1,525 | 1,470.00 |
| 11 - 6 | 1,415 - 1,525 | 1,470.00 |
| - 13 | 1,360 - 1,525 | 1,442.50 |
| - 20 | 1,350 - 1,450 | 1,400.00 |
| - 27 | 1,300 - 1,450 | 1,375.00 |
| 12 - 4 | 1,350 - 1,450 | 1,400.00 |
| - 11 | 1,350 - 1,450 | 1,400.00 |
| - 18 | 1,400 - 1,450 | 1,425.00 |
| - 31 | 1,400 - 1,450 | 1,425.00 |
| 1 - 8 - 80 | 1,350 - 1,450 | 1,400.00 |
| - 15 | 1,300 - 1,450 | 1,375.00 |
| - 22 | 1,300 - 1,450 | 1,375.00 |
| - 29 | 1,300 - 1,450 | 1,375.00 |
| 2 - 5 | 1,300 - 1,500 | 1,400.00 |
| - 12 | 1,400 - 1,500 | 1,450.00 |
| - 19 | 1,400 - 1,500 | 1,450.00 |
| - 26 | 1,400 - 1,500 | 1,450.00 |
| 3 - 4 | 1,400 - 1,500 | 1,450.00 |
| - 11 | 1,400 - 1,500 | 1,450.00 |
| - 18 | 1,350 - 1,500 | 1,425.00 |
| - 25 | 1,400 - 1,600 | 1,500.00 |
| 4 - 1 | 1,400 - 1,600 | 1,500.00 |
| - 8 | 1,400 - 1,600 | 1,500.00 |
| - 15 | 1,400 - 1,600 | 1,500.00 |
| - 22 | 1,400 - 1,550 | 1,475.00 |
| - 29 | 1,400 - 1,550 | 1,475.00 |
| 5 - 6 | 1,400 - 1,600 | 1,500.00 |
| - 13 | 1,400 - 1,550 | 1,475.00 |
| - 20 | 1,400 - 1,550 | 1,475.00 |
| - 27 | 1,500 - 1,600 | 1,500.00 |
| 6 - 3 | 1,500 - 1,600 | 1,550.00 |
| - 10 | 1,500 - 1,600 | 1,550.00 |

Average rate for shipping season: $1,450.98

The Boston rate range was calculated by multiplying a per box rate differential of $+.15 over the Chicago base rate by an estimated 1,000 boxes per truckload, and then adding this amount to the Chicago range.

Appendix table 11--Truck rate information on shipping Florida citrus: Orlando to Philadelphia

| Week | Rate range | Rate average |
|---|---|---|
| | Dollars | |
| 10 - 23 - 79 | 1,150 - 1,300 | 1,225.00 |
| - 30 | 1,215 - 1,325 | 1,270.00 |
| 11 - 6 | 1,215 - 1,325 | 1,270.00 |
| - 13 | 1,160 - 1,325 | 1,242.50 |
| - 20 | 1,150 - 1,250 | 1,200.00 |
| - 27 | 1,100 - 1,250 | 1,175.00 |
| 12 - 4 | 1,150 - 1,250 | 1,200.00 |
| - 11 | 1,150 - 1,250 | 1,200.00 |
| - 18 | 1,200 - 1,250 | 1,225.00 |
| - 31 | 1,200 - 1,250 | 1,225.00 |
| 1 - 8 - 80 | 1,150 - 1,250 | 1,200.00 |
| - 15 | 1,100 - 1,250 | 1,175.00 |
| - 22 | 1,100 - 1,250 | 1,175.00 |
| - 29 | 1,100 - 1,250 | 1,175.00 |
| 2 - 5 | 1,100 - 1,300 | 1,200.00 |
| - 12 | 1,200 - 1,300 | 1,250.00 |
| - 19 | 1,200 - 1,300 | 1,250.00 |
| - 26 | 1,200 - 1,300 | 1,250.00 |
| 3 - 4 | 1,200 - 1,300 | 1,250.00 |
| - 11 | 1,200 - 1,300 | 1,250.00 |
| - 18 | 1,150 - 1,300 | 1,225.00 |
| - 25 | 1,200 - 1,400 | 1,300.00 |
| 4 - 1 | 1,200 - 1,400 | 1,300.00 |
| - 8 | 1,200 - 1,400 | 1,300.00 |
| - 15 | 1,200 - 1,400 | 1,300.00 |
| - 22 | 1,200 - 1,350 | 1,275.00 |
| - 29 | 1,200 - 1,350 | 1,275.00 |
| 5 - 6 | 1,200 - 1,400 | 1,300.00 |
| - 13 | 1,200 - 1,350 | 1,275.00 |
| - 20 | 1,200 - 1,350 | 1,275.00 |
| - 27 | 1,300 - 1,400 | 1,350.00 |
| 6 - 3 | 1,300 - 1,400 | 1,350.00 |
| - 10 | 1,300 - 1,400 | 1,350.00 |

Average rate for shipping season: $1,250.98

The Philadelphia rate ranges were calculated by multiplying a per box rate differential of $.05 under the Chicago base rate by an estimated 1,000 boxes per truckload, and then subtracting this amount from the Chicago range.

Appendix table 11--Truck rate information on shipping Florida citrus: Orlando to Cincinnati

| Week | Rate range | Rate average |
|---|---|---|
| | Dollars | |
| 10 - 23 - 79 | 1,050 - 1,200 | 1,125.00 |
| - 30 | 1,115 - 1,225 | 1,170.00 |
| 11 - 6 | 1,115 - 1,225 | 1,170.00 |
| - 13 | 1,060 - 1,225 | 1,142.50 |
| - 20 | 1,050 - 1,150 | 1,100.00 |
| - 27 | 1,000 - 1,150 | 1,075.00 |
| 12 - 4 | 1,050 - 1,150 | 1,100.00 |
| - 11 | 1,050 - 1,150 | 1,100.00 |
| - 18 | 1,100 - 1,150 | 1,125.00 |
| - 31 | 1,100 - 1,150 | 1,125.00 |
| 1 - 8 - 80 | 1,050 - 1,150 | 1,100.00 |
| - 15 | 1,000 - 1,150 | 1,075.00 |
| - 22 | 1,000 - 1,150 | 1,075.00 |
| - 29 | 1,000 - 1,150 | 1,075.00 |
| 2 - 5 | 1,000 - 1,200 | 1,100.00 |
| - 12 | 1,100 - 1,200 | 1,150.00 |
| - 19 | 1,100 - 1,200 | 1,150.00 |
| - 26 | 1,100 - 1,200 | 1,150.00 |
| 3 - 4 | 1,100 - 1,200 | 1,150.00 |
| - 11 | 1,100 - 1,200 | 1,150.00 |
| - 18 | 1,050 - 1,200 | 1,125.00 |
| - 25 | 1,100 - 1,300 | 1,200.00 |
| 4 - 1 | 1,100 - 1,300 | 1,200.00 |
| - 8 | 1,100 - 1,300 | 1,200.00 |
| - 15 | 1,100 - 1,300 | 1,200.00 |
| - 22 | 1,100 - 1,250 | 1,175.00 |
| - 29 | 1,100 - 1,250 | 1,175.00 |
| 5 - 6 | 1,100 - 1,300 | 1,200.00 |
| - 13 | 1,100 - 1,250 | 1,175.00 |
| - 20 | 1,100 - 1,250 | 1,175.00 |
| - 27 | 1,200 - 1,300 | 1,250.00 |
| 6 - 3 | 1,200 - 1,300 | 1,250.00 |
| - 10 | 1,200 - 1,300 | 1,250.00 |

Average rate for shipping season: $1,150.98

The Cincinnati rate ranges were caluclated by multiplying a per box rate differential of $.15 under the Chicago base rate by an estimated 1,000 boxes per truckload, and then subtracting this amount from the Chicago range.

Appendix table 13--Drayage rates to Taft, Florida TOFC ramp

| Town | Charges |
|---|---|
| | Dollars |
| Aloma | 51.50 |
| Altamonte Springs | 63.06 |
| Apopka | 63.06 |
| Casselberry | 63.06 |
| Clermont | 63.06 |
| Deland | 63.06 |
| DeLeon Springs | 63.06 |
| Disney World | 51.50 |
| Eustis | 63.06 |
| Forest City | 63.06 |
| Groveland | 63.06 |
| Kissimmee | 63.06 |
| Lake Mary | 63.06 |
| Lockhart | 63.06 |
| Longwood | 63.06 |
| Maitland | 63.06 |
| Mount Dora | 63.06 |
| Ocoee | 63.06 |
| Orange City | 63.06 |
| Orlando Int'r Airport | 39.94 |
| Oviedo | 63.06 |
| Poinciana | 63.06 |
| Sanford | 63.06 |
| Tavares | 63.06 |
| Umatilla | 63.06 |
| Winter Garden | 63.06 |
| Winter Park | 51.50 |
| Zellwood | 63.06 |

Appendix table 14--Notes to table 11 on owner-operator truck cost analysis

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Assumptions: -average one-way trip length of 1,000 miles
-two pickups and two deliveries
-43 round-trips per year
-2 weeks vacation per year, 1 day per week off duty
-1 day delay to obtain backhaul at destination
-single driver
-total annual mileage of 92,500 miles
-average round-trip mileage of 92,500 miles
-average round-trip mileage including mileage for pickups and deliveries: 2,150 miles

Cost component:

1. Interest on equipment -- Calculated from a new tractor price of $74,151 and new trailer price of $31,779. Assumptions include a 20 percent salvage value at end of useful life, interest rate on tractor of 19 percent and on trailer of 21 percent. Interest cost is calculated on the basis of the following formula which provides an average interest cost per year over the life of the equipment, even though actual interest payments will decline as principal is paid off:

$$\frac{(\text{Purchase price} - \text{salvage value}) + \text{salvage value} \times \text{interest rate}}{2}$$

2. Management and overhead -- Updated using price indexes from Bureau of Labor Statistics, original data developed in "Cost of Operating Refrigerated Trucks for Hauling Fresh Fruit and Vegetables" by USDA agricultural economist Patrick Boles and a subsequent study on owner-operator truck costs by Boles.

3. Insurance on equipment -- Developed from above study and updated to a January 1, 1981, basis.

4. Licenses and permits -- Developed from above study and updated to a January 1, 1981, basis.

5. Vehicle depreciaiton -- Assumes maximum lifetime mileage of 650,000 for tractor and 750,000 for trailer. Annual depreciation expense was then calculated by the following formula for each piece of equipment:

$$\left[\frac{\text{Purchase price} - \text{salvage value}}{\text{Maximum lifetime mileage}}\right] \times \text{annual mileage}$$

Appendix table 14 continued:

6. Driver cost -- Annual wage expense for driver is obtained by multiplying an updated wage per mile (originally estimated in the Boles study as an opportunity cost to the driver) by the annual miles per year ($.1827 per mile x 92,500 miles per year = $16,901.60). From this driver income, Social Security tax at 8.1 percent of salary up to $22,000, and Worker's Compensation Insurance at 11.8 percent of salary is subtracted as a driver cost. Health insurance expense is an updated estimate from Boles' study. Subsistence expense is calculated on the basis of 256 days driving and 43 days laying-over for backhauls per year, with the driver incurring subsistence expenses of $17.13 on driving days and $28.55 on layover days.

7. Tractor fuel -- Based on the latest ICC diesel fuel estimate of $1.347 per gallon and a fuel consumption rate of 4.6 miles per gallon. Total annual mileage of 92,500 is multiplied times $\frac{\text{diesel cost per gallon}}{\text{miles per gallon}}$ to obtain total annual fuel expense.

8. Maintenance -- Based on cost estimates updated to a January 1, 1981, basis.

9. Tires -- Based on an updated tire cost of $328.85 per tire, expected mileage of 150,000 miles for each of the 18 tires on the rig.

10. Miscellaneous -- Includes updated cost estimates for refrigeration fuel, unloading fees, market fees, scale fees, telephone calls, tools, icing fees, etc. as obtained from the Boles' study.

Appendix table 15--Variable cost calculations for a TOFC movement from Orlando to Alexandria
(Cost in dollars)

| Line | Source | Region IV | Region II |
|---|---|---|---|
| Variable cost, line-haul--loaded front haul | | | |
| Car cost per revenue car-mile: | | | |
| 1. Cost per gross ton-mile | (See notes) | .00403 | 0.00400 |
| 2. Tare weight of TOFC car in tons | (given) | 30 | 30 |
| 3. Car tare cost | L1xL2 | .12084 | .12007 |
| 4. Train supplies per car-mile | (See notes) | .00347 | .00625 |
| 5. Car-mile ownership cost | (See notes) | .11376 | .10955 |
| 6. Private car inspection | (See notes) | .00837 | .01339 |
| 7. Car-mile cost other than tare | L4+L5+L6 | .12560 | .12919 |
| 8. Car-mile cost including tare | L3+L7 | .24644 | .24927 |
| 9. Ratio of total-to-loaded car-miles | T13,L13 | 1.41000 | 1.34000 |
| 10. Total car cost per revenue car-mile | L8xL9 | .34748 | .33402 |
| Trailer cost per revenue trailer-mile: | | | |
| 11. Tare weight of trailer | (given) | 7.5 | 7.5 |
| 12. Trailer tare cost | L1xL11 | .03021 | .03002 |
| 13. Ratio of total-to-loaded trailer-miles | (given) | 1.00000 | 1.00000 |
| 14. Trailer cost per revenue trailer-mile | L12xL13 | .03021 | .03002 |
| Cost per trailer-mile, car and trailer: | | | |
| 15. Number of trailers per car | (given) | 2.0 | 2.0 |
| 16. Car cost per trailer-mile | L10/L15 | .17374 | .16701 |
| 17. Cost per trailer-mile, car and trailer | L14+L16 | .20395 | .19703 |
| Lading cost per trailer-mile: | | | |
| 18. Lading weight per trailer in cwt | (given) | 470 | 470 |
| 19. Cost per cwt-mile | L1/20 | .00020 | .00020 |
| 20. Lading cost per trailer-mile | L18xL19 | .94660 | .94060 |
| Total line-haul cost: | | | |
| 21. Total line-haul cost per trailer-mile | L17+L20 | .29861 | .29109 |
| 22. Number of miles | (given) | 799 | 85 |
| 23. Total line-haul cost per trailer | L21xL22 | 238.58908 | 24.74232 |
| Variable cost, terminal--loaded front haul: | | | |
| 24. Terminal switching cost per car | T10,L5 | 20.57001 | 28.13000 |
| 25. Terminal switching cost per trailer | L24/L15 | 10.28500 | 14.06500 |

Appendix table 15--continued

| | | | | |
|---|---|---|---|---|
| 26. Station clerical cost per shipment | (See notes) | 1.37500 | | 2.40000 |
| 27. Number of trailers in shipment | (given) | 2 | | 2 |
| 28. Station clerical cost per trailer | L26/L27 | .68750 | | 1.20000 |
| 29. Trailer tying and untying | (See notes) | 14.73180 | | 28.43472 |
| 30. Special services per trailer | (See notes) | .19500 | | .58500 |
| 31. Terminal car ownership cost | (See notes) | 0 | | 0 |
| 32. Terminal ownership cost per trailer | L31/L15 | 0 | | 0 |
| 33. Terminal lading cost per cwt | T15/L17 | .00084 | | .00163 |
| 34. Terminal lading cost per trailer | L33xL18 | .39480 | | .76610 |
| 35. Total terminal cost per trailer | L's25+28+29+30+32+34 | 26.29408 | | 45.05081 |
| **Total variable cost--loaded front haul:** | | | | |
| 36. Total cost per trailer per region | L23+L35 | 264.88306 | | 67.79314 |
| 37. Total cost per trailer per region - updated | (See notes) | 348.85099 | | 90.73108 |
| 38. Total cost per trailer, origin plus destination | RIV+RII | | 439.58207 | |
| 39. Total variable cost per cwt, origin plus dest. | L38/L18 | | .93528 | |
| **Variable cost, line haul--empty return:** | | | | |
| 40. Cost per trailer-mile, car and trailer | L14+L16 | .20395 | | .19703 |
| 41. Lading weight per trailer in cwt | (given) | 0 | | 0 |
| 42. Cost per cwt-mile | L1/20 | .0020 | | .00020 |
| 43. Lading cost per trailer-mile | L41xL42 | 0 | | 0 |
| 44. Total line haul cost per trailer-mile | L40+L43 | .20395 | | .19703 |
| 45. Number of miles | (given) | 799 | | 85 |
| 46. Total line-haul cost per trailer | L44xL45 | 162.95560 | | 16.74741 |
| **Variable cost, terminal--empty return:** | | | | |
| 47. Terminal switching, station-clerical, tying and untying, spec. services, and ownership costs | Ls25+38+29+30+32 | 25.89929 | | 44.28471 |
| 48. Terminal lading cost per cwt | (given) | 0 | | 0 |
| 49. Terminal lading cost per trailer | L48xL41 | 0 | | 0 |
| 50. Total terminal cost per trailer | L47+L49 | 25.89929 | | 44.28471 |
| **Total variable cost--empty return:** | | | | |
| 51. Total cost per trailer per region | L46+L50 | 188.85489 | | 61.03212 |
| 52. Total cost per trailer per region - updated | (See notes) | 248.72189 | | 79.34176 |
| 53. Total cost per trailer, origin plus destination | RIV+RII | | 328.06365 | |
| 54. Total variable cost for roundtrip per trailer | L38+L53 | | 767.64572 | |

Appendix table 16--Variable cost calculations for a TOFC movement from Orlando to Philadelphia (Cost in dollars)

| Line | Source | Region IV | Region II |
|---|---|---|---|
| Variable cost, line-haul--loaded front haul | | | |
| Car cost per revenue car-mile: | | | |
| 1. Cost per gross ton-mile | (See notes) | 0.00403 | 0.00400 |
| 2. Tare weight of TOFC car in tons | (given) | 30 | 30 |
| 3. Car tare cost | L1xL2 | .12101 | .12007 |
| 4. Train supplies per car-mile | (See notes) | .00347 | .00625 |
| 5. Car-mile ownership cost | (See notes) | .11417 | .24391 |
| 6. Private car inspection | (See notes) | .00837 | .01339 |
| 7. Car-mile cost other than tare | L4+L5+L6 | .12601 | .26356 |
| 8. Car-mile cost including tare | L3+L7 | .24701 | .38363 |
| 9. Ratio of total-to-loaded car-miles | T13,L13 | 1.41000 | 1.34000 |
| 10. Total car cost per revenue car-mile | L8xL9 | .34829 | .51406 |
| Trailer cost per revenue trailer-mile: | | | |
| 11. Tare weight of trailer | (given) | 7.5 | 7.5 |
| 12. Trailer tare cost | L1xL11 | .03025 | .03002 |
| 13. Ratio of total-to-loaded trailer-miles | (given) | 1.00000 | 1.00000 |
| 14. Trailer cost per revenue trailer-mile | L12xL13 | .03025 | .03002 |
| Cost per trailer-mile, car and trailer: | | | |
| 15. Number of trailers per car | (given) | 2.00000 | 2.00000 |
| 16. Car cost per trailer-mile | L10/L15 | .17414 | .25703 |
| 17. Cost per trailer-mile, car and trailer | L14+L16 | .20440 | .28705 |
| Lading cost per trailer-mile: | | | |
| 18. Lading weight per trailer in cwt | (given) | 480 | 480 |
| 19. Cost per cwt-mile | L1/20 | .00020 | .00020 |
| 20. Lading cost per trailer-mile | L18xL19 | .09680 | .09606 |
| Total line-haul cost: | | | |
| 21. Total line-haul cost per trailer-mile | L17+L20 | .30120 | .38311 |
| 22. Number of miles | (given) | 787 | 250 |
| 23. Total line-haul cost per trailer | L21xL22 | 237.04419 | 95.77731 |
| Variable cost, terminal--loaded front haul: | | | |
| 24. Terminal switching cost per car | T10,L5 | 20.57001 | 28.13000 |
| 25. Terminal switching cost per trailer | L24/L15 | 10.28500 | 14.06500 |

Appendix table 16--continued

| | | | |
|---|---|---|---|
| 26. Station clerical cost per shipment | (See notes) | 1.37500 | 2.40000 |
| 27. Number of trailers in shipment | (given) | 2 | 2 |
| 28. Station clerical cost per trailer | L26/L27 | .68750 | 1.20000 |
| 29. Trailer tying and untying | (See notes) | 14.73180 | 28.43472 |
| 30. Special services per trailer | (See notes) | .19500 | .58500 |
| 31. Terminal car ownership cost | (See notes) | 0 | 0 |
| 32. Terminal ownership cost per trailer | L31/L15 | 0 | 0 |
| 33. Terminal lading cost per cwt | T15/L17 | .00084 | .00163 |
| 34. Terminal lading cost per trailer | L33xL18 | .40320 | .78240 |
| 35. Total terminal cost per trailer | L's25+28+29+30+32+34 | 26.30249 | 45.06711 |
| **Total variable cost--loaded front haul:** | | | |
| 36. Total cost per trailer per region | L23+L35 | 263.34668 | 140.84442 |
| 37. Total cost per trailer per region - updated | (See notes) | 346.82758 | 183.09775 |
| 38. Total cost per trailer, origin plus destination | RIV+RII | 529.92532 | |
| 39. Total variable cost per cwt, origin plus dest. | L38/L18 | 1.10401 | |
| **Variable cost, line haul--empty return:** | | | |
| 40. Cost per trailer-0mile, car and trailer | L14+L16 | .20440 | .28705 |
| 41. Lading weight per trailer in cwt | (given) | 0 | 0 |
| 42. Cost per cwt-mile | L1/20 | .00020 | .00020 |
| 43. Lading cost per trailer-mile | L41xL42 | 0 | 0 |
| 44. Total line haul cost per trailer-mile | L40+L43 | .20440 | .28705 |
| 45. Number of miles | (given) | 787 | 250 |
| 46. Total line-haul cost per trailer | L44xL45 | 160.85895 | 71.76254 |
| **Variable cost, terminal--empty return:** | | | |
| 47. Terminal switching, station-clerical, tying and untying, spec. services, and ownership costs | Ls25+28+29+30+32 | 25.89929 | 44.28471 |
| 48. Terminal lading cost per cwt | (given) | 0 | 0 |
| 49. Terminal lading cost per trailer | L48xL41 | 0 | 0 |
| 50. Total terminal cost per trailer | L47+L49 | 25.89929 | 44.28471 |
| **Total variable cost--empty return:** | | | |
| 51. Total cost per trailer per region | L46+L50 | 186.75824 | 116.04726 |
| 52. Total cost per trailer per region - updated | (See notes) | 245.96060 | 150.86144 |
| 53. Total cost per trailer, origin plus destination | RIV+RII | 396.82204 | |
| 54. Total variable cost for roundtrip per trailer | L38+L53 | 926.74736 | |

ons for a TOFC movement from Orlando to Cincinnati

| | Source | Region IV |
|---|---|---|
| 1 | | |
| | (See notes) | 0.00398 |
| | (given) | 30 |
| | L1xL2 | .11927 |
| | (See notes) | .00347 |
| | (See notes) | .10979 |
| | (See notes) | .00837 |
| | L4+L5+L6 | .12162 |
| | L3+L7 | .24089 |
| | T13,L13 | 1.41000 |
| | L8xL9 | .33966 |
| | (given) | 7.5 |
| | L1xL11 | .02982 |
| r-miles | (given) | 1.00000 |
| 14. Trailer cost per revenue trailer-mile | L12xL13 | .02982 |
| Cost per trailer-mile, car and trailer: | | |
| 15. Number of trailers per car | (given) | 2.00000 |
| 16. Car cost per trailer-mile | L10/L15 | .16983 |
| 17. Cost per trailer-mile, car and trailer | L14+L16 | .19965 |
| Lading cost per trailer-mile: | | |
| 18. Lading weight per trailer in cwt | (given) | 480 |
| 19. Cost per cwt-mile | L1/20 | .00020 |
| 20. Lading cost per trailer-mile | L18xL19 | .09541 |
| Total line-haul cost: | | |
| 21. Total line-haul cost per trailer-mile | L17+L20 | .29506 |
| 22. Number of miles | (given) | 937 |
| 23. Total line-haul cost per trailer | L21xL22 | 276.47046 |
| Variable cost, terminal--loaded front haul: | | |
| 24. Terminal switching cost per car | T10,L5 | 41.14002 |
| 25. Terminal switching cost per trailer | L24/L15 | 20.57000 |

Appendix table 17--continued

| | | |
|---|---|---|
| 26. Station clerical cost per shipment | (See notes) | 2.75000 |
| 27. Number of trailers in shipment | (given) | 2 |
| 28. Station clerical cost per trailer | L26/L27 | 1.37500 |
| 29. Trailer tying and untying | (See notes) | 29.46360 |
| 30. Special services per trailer | (See notes) | .39000 |
| 31. Terminal car ownership cost | (See notes) | 0 |
| 32. Terminal ownership cost per trailer | L31/L15 | 0 |
| 33. Terminal lading cost per cwt | T15/L17 | .00168 |
| 34. Terminal lading cost per trailer | L33xL18 | .80640 |
| 35. Total terminal cost per trailer | L's25+28+29+30+32+34 | 52.60498 |
| **Total variable cost--loaded front haul:** | | |
| 36. Total cost per trailer per region | L23+L35 | 329.07544 |
| 37. Total cost per trailer per region - updated | (See notes) | 433.39235 |
| 38. Total cost per trailer, origin plus destination | RIV+RII | 433.39235 |
| 39. Total variable cost per cwt, origin plus destination | L38/L18 | .90290 |
| **Variable cost, line haul--empty return:** | | |
| 40. Cost per trailer-0mile, car and trailer | L14+L16 | .19965 |
| 41. Lading weight per trailer in cwt | (given) | 0 |
| 42. Cost per cwt-mile | L1/20 | .00020 |
| 43. Lading cost per trailer-mile | L41xL42 | 0 |
| 44. Total line haul cost per trailer-mile | L40+L43 | .19965 |
| 45. Number of miles | (given) | 937 |
| 46. Total line-haul cost per trailer | L44xL45 | 187.06746 |
| **Variable cost, terminal--empty return:** | | |
| 47. Terminal switching, station-clerical, tying and untying, spec. services, and ownership costs | Ls25+28+29+30+32 | 51.79860 |
| 48. Terminal lading cost per cwt | (given) | 0 |
| 49. Terminal lading cost per trailer | L48xL41 | 0 |
| 50. Total terminal cost per trailer | L47+L49 | 51.79860 |
| **Total variable cost--empty return:** | | |
| 51. Total cost per trailer per region | L46+L50 | 238.86604 |
| 52. Total cost per trailer per region - updated | (See notes) | 314.58657 |
| 53. Total cost per trailer, origin plus destination | RIV+RII | 314.58657 |
| 54. Total variable cost for roundtrip per trailer | L38+L53 | 747.97892 |

Appendix table 18--Variable cost calculations for a TOFC movement from Orlando to Chicago
(Cost in dollars)

| Line | Source | Region IV |
|---|---|---|
| Variable cost, line-haul--loaded front haul | | |
| Car cost per revenue car-mile: | | |
| 1. Cost per gross ton-mile | (See notes) | 0.00390 |
| 2. Tare weight of TOFC car in tons | (given) | 30 |
| 3. Car tare cost | L1xL2 | .11707 |
| 4. Train supplies per car-mile | (See notes) | .00347 |
| 5. Car-mile ownership cost | (See notes) | .10426 |
| 6. Private car inspection | (See notes) | .00837 |
| 7. Car-mile cost other than tare | L4+L5+L6 | .11609 |
| 8. Car-mile cost including tare | L3+L7 | .23316 |
| 9. Ratio of total-to-loaded car-miles | T13,L13 | 1.41000 |
| 10. Total car cost per revenue car-mile | L8xL9 | .32876 |
| Trailer cost per revenue trailer-mile: | | |
| 11. Tare weight of trailer | (given) | 7.5 |
| 12. Trailer tare cost | L1xL11 | .02927 |
| 13. Ratio of total-to-loaded trailer-miles | (given) | 1.00000 |
| 14. Trailer cost per revenue trailer-mile | L12xL13 | .02927 |
| Cost per trailer-mile, car and trailer: | | |
| 15. Number of trailers per car | (given) | 2.00000 |
| 16. Car cost per trailer-mile | L10/L15 | .16438 |
| 17. Cost per trailer-mile, car and trailer | L14+L16 | .19365 |
| Lading cost per trailer-mile: | | |
| 18. Lading weight per trailer in cwt | (given) | 410 |
| 19. Cost per cwt-mile | L1/20 | .00020 |
| 20. Lading cost per trailer-mile | L18xL19 | .08000 |
| Total line-haul cost: | | |
| 21. Total line-haul cost per trailer-mile | L17+L20 | .27365 |
| 22. Number of miles | (given) | 1234 |
| 23. Total line-haul cost per trailer | L21xL22 | 337.67993 |
| Variable cost, terminal--loaded front haul: | | |
| 24. Terminal switching cost per car | T10,L5 | 41.14002 |
| 25. Terminal switching cost per trailer | L24/L15 | 20.57000 |

Appendix table 18--continued

| | | |
|---|---|---|
| 26. Station clerical cost per shipment | (See notes) | 2.75000 |
| 27. Number of trailers in shipment | (given) | 2 |
| 28. Station clerical cost per trailer | L26/L27 | 1.37500 |
| 29. Trailer tying and untying | (See notes) | 29.46360 |
| 30. Special services per trailer | (See notes) | .39000 |
| 31. Terminal car ownership cost | (See notes) | 0 |
| 32. Terminal ownership cost per trailer | L31/L15 | 0 |
| 33. Terminal lading cost per cwt | T15/L17 | .00168 |
| 34. Terminal lading cost per trailer | L33xL18 | .68880 |
| 35. Total terminal cost per trailer | L's25+28+29+30+32+34 | 52.48736 |
| **Total variable cost--loaded front haul:** | | |
| 36. Total cost per trailer per region | L23+L35 | 390.16726 |
| 37. Total cost per trailer per region - updated | (See notes) | 513.40414 |
| 38. Total cost per trailer, origin plus destination | RIV+RII | 513.40414 |
| 39. Total variable cost per cwt, origin plus destination | L38/L18 | 1.25221 |
| **Variable cost, line haul--empty return:** | | |
| 40. Cost per trailer-mile, car and trailer | L14+L16 | .19365 |
| 41. Lading weight per trailer in cwt | (given) | 0 |
| 42. Cost per cwt-mile | L1/20 | .00020 |
| 43. Lading cost per trailer-mile | L41xL42 | 0 |
| 44. Total line haul cost per trailer-mile | L40+L43 | .19365 |
| 45. Number of miles | (given) | 1234 |
| 46. Total line-haul cost per trailer | L44xL45 | 238.96028 |
| **Variable cost, terminal--empty return:** | | |
| 47. Terminal switching, station-clerical, tying and untying, spec. services, and ownership costs | Ls25+28+29+30+32 | 51.79860 |
| 48. Terminal lading cost per cwt | (given) | 0 |
| 49. Terminal lading cost per trailer | L48xL41 | 0 |
| 50. Total terminal cost per trailer | L47+L49 | 51.79860 |
| **Total variable cost--empty return:** | | |
| 51. Total cost per trailer per region | L46+L50 | 290.75888 |
| 52. Total cost per traielr per region - updated | (See notes) | 382.92916 |
| 53. Total cost per trailer, origin plus destination | RIV+RII | 382.92916 |
| 54. Total variable cost for roundtrip per trailer | L38+L53 | 896.33330 |

The following notes represent an explanation of the procedures and sources used in the variable cost calculations of TOFC movements for this study.

Because many of the costing steps illustrated in the preceeding appendix tables are simply computational in nature and self-explanatory, we will concentrate on only those costing lines in which we have listed (see notes) or (given) as a source in the cost calculations.

In general, the costing procedure is based on the Interstate Commerce Commission's "1977 Rail Carload Cost Scales," Statement No. ICI-77 (referred to as ICC Rail Form A), a study which developed costs and a costing procedure based upon the 1977 operations of Class I line-haul railroads (defined as having revenues of $10 million or more) on a regional basis throughout the United States. The value of costs obtained by this costing procedure lies in their predictive value for actual, present-day service costs and is directly related to the accuracy of individual cost components. Therefore, we have substituted actual operating information and costs for the regional costs provided by the ICC Rail Form A approach, where possible.

Those lines in the costing which have a source prefaced by the letter T (as in the line 9 source of T13, L13) refer to the use of regional cost averages from ICC Rail Form A and indicate a specific table and line in the "1977 Rail Carload Cost Scales" where the source of the cost may be found. Where we have substituted actual cost and operating information into the costing prblem, we have listed the source as (See notes) and where we have listed a source as (given), the information is based on the problem definition (as in line 11, the tare weight of the trailer). The specificity involved in this rail costing was possible because of the development of a computer program which made possible the fast and reliable calculation of total rail costs for a variety of cost variables.

Line 1 - represents a weighted average cost per gross ton-mile for origin and destination where the weights are the ratios of way-to-total and through-to-total mileage for both origin and destination.

Line 2 - From interviews with a company which provides the specific type of flatcar to be used in TOFC service by the participating railroads to the various market destinations, we determined that the flatcars vary from 50,000 to 60,000 pounds in weight depending on age and model. For costing purposes, we used a conservative estimate of 30 tons for the tare weight.

Lines 4, 5, and 6 - all involve costs per car-mile, which consist of train supplies-running, ownership costs and, in the case of nonrail-owned rolling stock, private car inspection costs. The components of ownership cost are costs for time running, time in interchange switching, time in inter- and intra-train switching. In the case of private mileage-only cars, which TOFC flats are almost exclusively, the cost for time running is reduced to the mileage rate and the cost for time in interchange and other switching is zero. In the present instance, the ownership costs for switch-engine time are calculated on a specified number of interchange and other switches, based on the problem definition. These specific costs from tables 12 and 13 of "1977 Rail Carload Cost Scales" are converted to a mileage rate based on an average number of trainmiles between interchanges or inter- and intra-train switches, respectively.

Line 11 - based on estimates of trailer leasing company for the specified TOFC trailer; includes 11,960 pounds for the trailer, 1,760 pounds for refrigerator, 58 pounds for batteries, 200 pounds for fuel tank, and 385 pounds for fuel (assuming tank is 50 percent full on average) for a total of 14,363 pounds, which was rounded up to 7.5 tons for costing purposes.

Line 13 - refers to the ratio obtained when dividing loaded or revenue trailer miles by total trailer miles. In this Plan III movement utilizing shipper-provided trailers where all trailer miles are revenue miles to the railroad, the ratio is one.

Line 15 - assumes that each shipment will consist of at least two trailers. The major impact of the assumption of a two-trailer shipment rather than a single-trailer shipment is a decrease in station clerical, billing cost per trailer. Since this cost is generally the same for a two-trailer shipment as for a one-trailer shipment, increasing trailers per shipment will decrease cost allocated to each trailer.

Line 18 - Calculation of the lading weight in cwt per ramp destination was illustrated previously. The major constraint on load weight was assumed to be the most restrictive load limit of any state through which the load must be drayed to reach the destination market.

Line 22 and 45 - Actual rail mileage to each destination ramp was obtained from cooperating railroads.

Line 26 - refers to those administrative terminal expenses allocated to the handling of each shipment including auditing, etc., in general offices.

Line 29 - includes not only the cost of loading the trailer onto the TOFC car at origin and unloading it from the TOFC car at destination, but also all expenses incurred in the vicinity of the TOFC ramp subsequent to the completion of pickup service at origin and prior to the commencement of the delivery service at destination.

Line 30 - includes a miscellany of items concerning car preparation, such as cleaning, appropriate to the servicing requirements for movement of refrigerated produce.

Line 31 - Since the flatcars needed for the TOFC movement are to be leased, no terminal car ownership costs will be incurred by the railroad.

Lines 37 and 52 - The ICC issues rail-cost update ratios for updating 1977 rail costs to a current basis. The ratios indicate changes in the cost of providing rail service and measure differences in the cost of items such as wages, fuel, materials, and supplies. We have used ratios (1.300 for Official Territory and 1.317 for the Southern Region) which update costs to October 1980.

Line 41 - Since return trip cost is calculated on an empty return basis, there is no lading weight.

Line 48- Since there is no lading weight on an empty return, there can be no terminal lading cost.

## Supplementary Note: Organizational Structures and their Legal Considerations

Setting up an organization to transport or arrange for transportation of goods in interstate commerce will require familiarity with the regulatory statutes. Several exemptions are discussed that may be available for the systems that are recommended. No legal conclusions should be drawn from them, however. Early guidance by a knowledgeable attorney is essential in this specialized area.

Agricultural producers shipping their products in interstate commerce have three exemptions from transportation economic regulation available to them. First is the agricultural cooperative exemption in Part II of the Interstate Commerce Act of 1887 (Part II was added in 1935 and applies to motor carriers). Second and third are exemptions from regulation as freight forwarders in Part IV of the Act (Part IV was added in 1942). A properly organized and operated agricultural cooperative can fit any of these three exemptions, with the choice depending on the system's needs, and the advantages or disadvantages of each exemption.

Public Law 95-473, October 17, 1978, was passed to revise, codify, and enact without substantive change the Interstate Commerce Act and related laws as Subtitle IV of Title 49, United States Code, "Transportation." The following will reference the Section and Part numbers of the Act as passed by the 95th Congress.

**Subchapter II, Interstate Commerce Act**

Title 49 U.S.C. Section 10526(a)(5) lists a number of exemptions from Subchapter II requirements relating to certificates of public convenience and necessity for motor carriers and to other regulation of motor carriers under Subchapter II. Exemption of section 10526(a)(5) states that:

The Interstate Commerce Commission does not have jurisdiction under this subchapter over -

> (5) a motor vehicle controlled and operated by a cooperative association (as defined by section 1141j(a) of title 12) or by a federation of cooperative associations if the federation has no greater power or purposes than a cooperative association, except that if the cooperative association or federation provides transportation for compensation between a place in a State and a place in another State, or between a place in a State and another place in the same State through another State -
>
> > (A) for a nonmember that is not a farmer, cooperative association, federation, or the United States Government, the transportation (except for transportation otherwise exempt under this subchapter) -

(i) shall be limited to transportation incidental to the primary transportation operation of the cooperative association or federation and necessary for its effective performance;
(ii) may not exceed in each fiscal year 25 percent of the total transportation of the cooperative association or federation between those places, measured by tonnage; and
(iii) shall be provided only after the cooperative association or federation notifies the Commission if its intent to provide the transportation; and

(B) the transportation for all nonmembers may not exceed in each fiscal year, measured by tonnage, the total transportation between those places for the cooperative association or federation and its members during that fiscal year;

The Agricultural Marketing Act of 1929, as amended, (12 U.S.C section 1141j from which the basic definition of a cooperative is drawn reads as follows:

The term cooperative association means any association in which farmers act together in processing, preparing for market, handling, and/or marketing the farm products of persons engaged, and also means any association in which farmers act together in purchasing, testing, grading, processing, and/or distributing farm business services. Provided, however, that such associations are operated for the mutual benefit of the members thereof as such producers or purchasers and conform to one or both of the following requirements:

First. That no member of the association is allowed more than one vote because of the amount of stock or membership capital he may own therein; and

Second. That the association does not pay dividends on stock or membership capital in excess of 8 per centum per annum. And in any case to the following:

Third. That the association shall not deal in farm products, farm supplies, and farm business services with or for nonmembers in an amount greater in value than the total amount of such business transacted by it with or for members. All business transacted by any cooperative association for or on behalf of the United States or any agency or instrumentality thereof shall be disregarded in determining the

> volume of member and nonmember business transacted by such association.

Regulations issued by the Interstate Commerce Commission further define the limits of the exemption, practices within those limits in 49 Code of Federal Regulations (C.F.R.) sections 1047.20-1047.23, and proposed regulations in 43 Federal Register (F.R.) pp. 2396-2400 (Jan. 17, 1978). Growth of a few "sham" cooperatives that are not true agricultural cooperatives but that have tried to come within the exemption has resulted in the Commission becoming more stringent in administering these regulations. However, legitimate agricultural cooperatives should have no difficulty meeting the requirements.

The requirement concerning membership in the agricultural cooperative is particularly important: for a cooperative to qualify for the exemption, all members must be farmers. Presence of any nonfarmer members will destroy the exemption.

In addition, restrictions on transportation by qualified agricultural cooperatives are important to note. The cooperative is forbidden to transport more tonnage for nonmembers than for members. The cooperative is also limited to providing no more than 25 percent of its transportation for nonmembers who are not agricultural producers, and such transportation must be incidental to its primary transportation operation. These specific restrictions must be added to the requirements for the true cooperative operation.

The agriculture cooperative exemption found in Subchapter II of the ICC Act U.S.C. 10526(a)(5) would be ideally suited for organizing, if it were not so restrictive. The cooperative exemption, in limiting the nonmember nonexempt volume, restricts backhauls of general commodities to no more than 25 percent. This limitation forces the shippers to return trailers empty at considerable expense and wasted energy.

**Subchapter IV, Interstate Commerce Act**

Subchapter IV of the Interstate Commerce Act deals with freight forwarders. Freight forwarders have been defined in the Act to mean any person

> (8)... holding itself out to the general public (other than as an express, pipeline, rail, sleeping car, motor, or water carrier) to provide transportation of property for compensation and in the ordinary course of its business--
>
> A. assembles and consolidates, or provides for assembling and consolidating shipments and performs

> or provides for break-bulk and distribution operations of the shipments;
>
> B. assumes responsibility for the transportation from the place of receipt to the place of destination; and
>
> C. uses for any part of the transportation a carrier subject to the jurisdiction of the Interstate Commerce Commission under subchapter I, II, or III of chapter 105 of this title.

Freight forwarders are required to obtain a permit to operate and are subject to ICC regulation. There are organizations, however, exempt from Subchapter IV regulation. One is an agricultural cooperative defined by the same statute referred to in Subchapter II. That exemption is found in 49 U.S.C. section 10562(1).

> The Interstate Commerce Commission does not have jurisdiction under this subchapter over--
>
> (1) service provided by, or under the direction of, a cooperative association (as defined by section 1141j(a) of title 12) or by a federation of cooperative associations if the federation has no greater power or purposes than a cooperative association;

The requirement of total farmer membership remains the same as in the Subchapter II exemption.

A second Subchapter IV exemption is not restricted to farmer cooperatives and is available for use by an association whose members are nonfarmers or, of course, a mixture of farmers and nonfarmers. The exemption is found at 49 U.S.C. section 10562(3) and (4). It reads:

> The Interstate Commerce Commission does not have jurisdiction under this subchapter over--
>
> (3) the service of a shipper or a group of shippers in consolidating or distributing freight on a nonprofit basis, for the shipper or members of the group to secure carload, truckloads, or other volume rates; or
>
> (4) the service of an agent of a shipper in consolidating or distributing pool cars when the service is provided for the shipper only in a terminal area in which the service is performed.

This provision (specifically subsection (3)) appears to fit the needs of the grower-shipper group. In addition, it permits flexibility in the membership required by the nature of prospective participants in the recommended system. Because the grower-shipper group may find Subchapter IV of particular use, the position of the ICC and the courts should be carefully considered.

Regulation under Subchapter IV applies only to freight forwarders and a shippers' association must have certain characteristics to be exempt from these regulations. The characteristics of an exempt shippers' association, as well as features of the regulated freight forwarder and the organization and operations of a shipper's association, are discussed below.

The first requirement for Subchapter IV treatment is that the activities of an individual or association actually are those of a freight forwarder. The statute quoted lists three requirements: Clause A describes the overall pattern of freight forwarding. Clause B specifies that the freight forwarder takes the responsibility for transporting goods from the initial point of receipt to the final destination. Finally, Clause C requires that a common carrier be used for some part of the transportation from origin to destination.

A typical freight forwarding operation is described by the District Court in National Motor Freight Traffic Association v. United States, 253 F. Supp 661 (D.D.C. 1966).

> Freight forwarders collect and consolidate less than carload or less than truckload shipments and secure common carrier transportation for the long haul movement of property owned by individual shippers by carload or truckload. In accomplishing this, the forwarder consolidates several small, less than truckload shipments into a full truckload or carload quantity which then moves over the major portion of the journey by common carrier at the lower truckload or carload rate. In reality what may appear as a single operation actually involves three distinct phases, each phase involving a different common carrier. First the goods of each individual shipper are carried to a central consolidation point. Second, the aggregated property then is transported over the line haul by a common carrier to a break-bulk distributioin point; and finally, the goods are moved from the distribution center to the various ultimate consignees. Without the intervention of the forwarder each small individual shipper would be required to deal with the several carriers involved, paying each carrier the more

> expensive less-than-truckload or less-than-carload rate for the entire movement from pick-up point to the final delivery point. The freight forwarders offer the shipper a more expeditious, comprehensive transportation service at a lesser cost. The details of arranging transportation are completely cared for by the forwarder and some savings are passed on to the shipper through the differential between full capacity truckload and carload rates over the line haul and more expensive less-than-truckload or less-than-carload rates over the line haul.

Conditions listed in the statute are not mere suggestions for convenient operation. They are legal requirements. Each condition must be separately satisfied before Part IV can be used.

An association acting as a freight forwarder must perform at least the essential functions described in Clause A. A forwarder that operated at a single terminal point did not qualify because it did not perform enough of those essential functions (National Motor Freight Traffic Association v. United States, 242 F. Supp. 601 (D.D.C. 1965)). A shippers' association may arrange with agents to perform certain of the functions (Columbia Shippers and Receivers Association v. United States, 301 F. Supp. 310 (D. Del. 1969)). A shippers' association may utilize terminals at the point of origin and destination of the shipment without being subject to regulation. Also, the agencies that provide for the assembly, consolidation, and distribution of the small shipments are not carriers requiring licenses (Gilbert Carrier Corporation v. Receivers and Shippers, Inc., 350 F. Supp. 1119 (C. D. Cal. 1972)). Under some circumstances members themselves may perform some of the functions (National Motor Freight Traffic Association v. United States, 205 F. Supp. 592 (D.D.C. 1962)).

The true freight forwarder also must assume responsibility for the transportation. An association that does not take that responsibility from point of receipt to point of destination cannot qualify as a freight forwarder (National Motor Freight Traffic Association v. Delaware Valley Freight Terminal, 323 I.C.C. 560 (1963), aff'd, National Motor Freight Traffic Association v. United States, 242 F. Supp. 601 (D.D.C. 1964).

Finally, the freight forwarder must use a common carrier for part of the transportation. In one case an association that consolidated shipments but transported them in its own leased vehicles to the final destination was held not to be a freight forwarder (I.C.C. v. International Shippers Association of New Jersey, Inc., 249 F. Supp. 66 (D.N.J. 1965), aff'd, 363 F. 2d 878 (3d. Cir. 1966)).

**Shippers' Association Requirements**

When the basic requirements for coverage as a Subchapter IV freight forwarder are met, the exemption for Subchapter IV regulation extends to those shippers' associations that meet statutory requirements of 49 U.S.C. 10562(3). It should be noted that 49 U.S.C. 10562(3) and (4) are "clarifying" provisions rather than a true exemption from Part IV of the regulation. The definition of freight forwarder includes only those persons who offer themselves to the general public to transport or provide transportation as described in the statute. A shippers' association does not in fact do this but serves only its members for their benefit. As stated in the House Committee on Interstate and Foreigh Commerce Report no. 1172:

> The definition of freight forwarders includes only those persons who hold themselves out "to the general public" to transport or provide transportation of property for compensation, and only those who, in the ordinary and usual course of their business, perform or provide the performance of both the assembling and concentrating operations and the break-bulk and distributing operations in the through movement of property, and only those who assume a common-carrier responsibility for the transportation and safety of the property from point of receipt to point of destination.
>
> The definition, therefore, draws a line of distinction which clearly excludes brokers, nonprofit associations of shippers, warehousemen, and pool-car operators, as those persons normally operate, since such persons do not do all of the things required under the definition to constitute a freight forwarder. In order to make absolutely sure, however, that the definition cannot by construction be held to cover shippers, groups of shippers, and nonprofit associations of shippers, consolidating or distributing freight for themselves or their members, or to cover warehousemen, pool-car operators, and other shippers' agents engaged in consolidating or distributing pool cars, and not assuming responsibility for the through movement of the property, subsection (c) was included in this section.

A regulated freight forwarder and an unregulated shipper's association cannot be distinguished on the basis of their physical operations. Instead, the distinguishing features are found in the relationship between the organization and those with whom it deals. The ICC in Atlanta Shippers Association--Investigation of Operations, 322 I.C.C. 273 (1964), said:

> In order properly to pinpoint those considerations determinative of the status under Part IV of a given

transportation operation actually conducted by a self-styled shipper's organization, the functional similarities and differences between the services provided by a forwarder and the operations of a lawful nonprofit group or association of shippers need to be noted. Thus, both the freight forwarder and a shipper's association lawfully operating under the provisions of section 402(c) (the previous reference for this exemption prior to revision of the Act) ordinarily assemble and consolidate or provide for the assembling and consolidating of shipments; both normally perform or provide for the performance of break-bulk and distributing operations with respect to such consolidated shipments; and both utilize, for at least part of the transportation of such shipments, the services of a carrier or carriers subject to part I, II, or III of the act. In essence, then, the shipper obtains from the nonprofit group or association of which it is a member the same physical transportation service as that which it would receive from any recognized forwarder. The functional distinction between regulated and nonregulated consolidating and distributing operations is therefore to be found not in their physical service characteristics which are thus identical for all practical purposes. Instead, the regulated freight forwarder is distinguished by statute from the nonregulated shipper's organization by the fact that it holds itself out to the general public, for compensation, to deliver safely at destination those shipments entrusted to its care.

Whether an activity conducted by a shippers' group or association and otherwise meeting the physical requirements of a forwarding service is held out to the general public for compensation so as to constitute the group or association a vendor of forwarding service, i.e., a freight forwarder, ultimately and necessarily depends upon the factual relationship between the group or association performing the operation and the receipients or beneficiaries of such operation.

The shippers' association is a membership operation, distinguished from other organizations by the agency relationship between the members and the group. The shipper's association is not an organization that sells a service to members, it is an agent of the members and it acts solely on their behalf.

The statute quoted above gives only brief statements about qualifying features. The association must operate to secure benefits of carload, truckload, or other volume rates; it must operate to obtain those benefits for its members; and it must operate on a nonprofit basis. A number of other principles,

however, are implied by those statements and some have been elaborated by the Commission and the courts. The following discussion cannot cover all stated and implied requirements for 49 U.S.C. 10562(3) and (4); it merely suggests ideas to consider in forming an exempt freight forwarder-shippers' association.

For summary purposes, there are four primary characteristics a shippers' association must possess to receive 49 U.S.C. 10562(3) status in Subchapter IV. First, the association must be under the control and direction of the association members. Second, the essential risks and burdens of the enterprise must be borne by the association. Third, the association just be operated for benefit of members only. Finally, the association must be operated on a nonprofit basis.

Various decisions have listed member control and assumption of risks and burdens as the major point of contention, although member benefit and nonprofit qualification characteristics are required. In fact, the four principles cannot be separated. Total operation of the association must meet all requirements. If the association does not reflect one of the principles, it will very likely not meet others.

From the point of view of shippers and growers contemplating a shippers' association, the principle of member control is paramount. Brief exposure to Commission decisions and court cases suggests that the first step in the failure of a shippers' association to conform to the law is lack of true member control.

A Federal District Court in the case C-Line, Inc. v. United States, 376 F. Supp. 1043 (D. R. I. 1974), stated: "There is a well defined relationship between an exempt shippers' association and its members, which is characterized by control of membership over the transportation activities of the association." As stated in Atlanta Shippers Association--Investigation of Operations, 316 I.C.C. 259 (1962).

> If any person or persons, other than the shipper-members themselves, possess even the right or privilege to control, or in fact actually control the freight consolidation and distribution services, it is they, and not the shippers, who through the purported association are performing such activities; in such event, the operation being conducted in the name of the shippers or in the name of their group or association is not within the exclusion of section 402(a) but is, in substance, a common carrier freight forwarding service for which authority is required. In these circumstances, the controlling

> persons will be regarded as having assumed the necessary responsibility for the transportation from point of receipt to point of destination within the meaning of the freight forwarder definition.

Conscious delegation of all responsibility is also a loss of control. "Where it is shown that the association members, though enjoying the benefits of a complete transportation service at volume rates, have not retained effective control over the movement of their freight but, instead, have delegated all responsibility therefore to purported agents or employees, then for all practical purposes, they have invested the latter with the fundamental characteristics of an included entrepreneur, the operations of which, if otherwise within the definition of a freight forwarder, are subject to the Act's licensing requirements." New Orleans Shippers Association, Investigation Of Operations, 323 I.C.C. 619 (1964).

A clear example of the member control problem is given in Freight Forwarders Institute v. United States, 263 F. Supp. 460 (S. D. N. Y. 1967). The association in question was Piggy-Back Shippers Association in Florida, organized by a Mr. Helin to use truck-on-flat-car services. Helin contacted the initial group of shipper members, drew up the association's articles and bylaws, called the organizational meeting, actually appointed the "elected" members of the board of directors, and obtained a contract as general manager with compensation based on total tonnage shipped. Thereafter Helin exercised a free hand, unencumbered by effective control by the board of directors whose principal decision at board meeting amounted to approval of new membership applications secured by Helin. It was held that requisite membership control was lacking.

Dissatisfaction with Helin's operations led the members to take control of the association, hire a new manger, and operate as a proper association. At that point Piggy-Back was no longer a "paper" association of the general manager's own design or a cloak under which an independent entrepreneur was acting, and was held to be operating in conformance with 402(c) requirements.

The association must not permit others to assume the risks and burdens of the enterprise. Responsibility for transportation from point of receipt to point of destination was not found in the association where "persons other than the shipper-members of the association bear the essential risks and burdens of the consolidating and distributing operations." Atlanta Shippers Association--Investigation of Operations, 316 I.C.C. 259 (1962). It was also stated:

> The same conclusion clearly must obtain in those situations in which persons other than the shipper-members of the association bear the essential risks and burdens of the consolidating and distributing operations in question. Where, however, the shipper-members themselves, to the exclusion of all others, control, direct, and dominate the activities in question and assume jointly and severally all the risks and burdens of conducting such operations, such consequences cannot be said to result and the operations could be of the character specifically safeguarded by section 402(a) of the act.

The assumption of risk and responsibility is closely associated with control. In Columbia Shippers and Receivers Association v. United States, 301 F. Supp. 310 (D. Del. 1969), a challenge to assumption of risk was defeated when the court stated that retention by members of the right to control and dominate the association is an indication that essential risks and burdens have not been passed on to third parties.

A shippers' association must be operated for the benefit of the members as described in the statute. Two requirements are tied up in this principle. Benefits must flow only to members, and benefits must be associated with transportation cost saving, not the profitable operation of a transportation system. The Commission in Atlanta Shippers Association--Investigation of Operations, 316 I.C.C. 259 (1962) summarizes the two requirements:

> The essential predicate of any bona fide shippers' association is that the association, at all times and with respect to each less-than-truckload or less-than-carload shipment moving in its service, must act as agent for its lawful shipper-members in reducing the "transportation costs to the members through savings effected in cooperation with other members who likewise employ the association as transportation agent." In other words, the avowed purpose, and the practical result, of an associations's combining freight of its members must not be to obtain any benefit for the shipper other than the lowering of the transportation costs of the members through savings effected in cooperation with other members "who likewise employ the association agent." As a consequence, in order to avoid being characterized as a "for compensation" or for-hire freight forwarder, a group or association of shippers must affirmatively stand aloof to the lure of a public calling and may not lawfully handle non-members's shipments which have no connection with, nor fundamental relation to, the business of its shipper-members. Whenever the freight consolidating and distributing services

> performed in connection with nonmember shipments by the group or association of shippers is supplied with a purpose to profit from the effort itself as distinguished from a purpose merely to obtain for its members the benefits of carload, truckload, or other volume rates, then the operation is, in substance, a common carrier freight forwarding service for compensation.

The nonprofit nature of a shippers' association exempt under 49 U.S.C. 10562(3) is explicit. The nonprofit characteristic also flows from the nature of the association and its relationship to its members. In a case that questioned the use of f.o.b. shipping, the Commission held that such a practice destroyed the nonprofit status because the association did not take responsibility for shipping costs, the benefits being a profit to the association. In its rejection of that view, the U. S. Supreme Court in United States v. Pacific Coast Wholesalers' Association, 388 U.S. 689,70 S.Ct. 411, 94 L Ed. 474 (1950) discussed the meaning of nonprofit operations. "(A lower court) considered as decisive that no shipments by the association were ever undertaken except at the behest and for the benefit of a member. Looking to the agency between member and association, rather than that between buyer and seller, the court saw no reasonable grounds for ruling that the association was on a profit basis, or that it was holding its services out to the general public. We agree."

In a situation where nonmembers operated the association, a court scrutinized the substantial income received by those who did control the association. They listed as items of an expense account such things as entertainment, travel, sales promotion, and Christmas gifts. Though the association itself did not have a profit, the court said that "these expenses are typical of a profit-making operation rather than a nonprofit shippers' association." Freight Consolidations Cooperative, Inc. v. United States, 230 F. Supp. 692 (S. D. N.Y. 1964).

**Form of Organization**

If the association of shippers meets the statutory requirements, the technical form of organization is not restricted. The organizational structure, whether unincorporated organization or incorporated association, is open. A corporation normally insulates its individual shareholders from liability beyond their investment. An argument was made that such insulation made it impossible for the association to meet the assumption of risk and burden rule. That argument, however, was not accepted by the Commission. The "fact of incorporation, standing alone, does not affect the status under Subchapter IV of otherwise lawful shipper-association operations." Atlanta Shippers Association--Investigation of Operations, 322 F.C.C. 273 (1964). The commission added:

> We do not mean to say, however, that the circumstance of incorporation, and the fact surrounding such incorporation, are not something to be weighted in ascertaining the basic nature and true status of purported shipper-association operations. We will go behind the corporate form in any case to establish the essential facts. These facts, like all others attendant to a given operation, must be weighed and considered together in order to arrive at a correct assessment of the "total" fact situation. And where it appears that the corporate form of enterprise has been pruposely chosen as a subterfuge or device by which to escape regulation under the act, appropriate weight will be accorded that fact in finding the operations in question to be those for which authority is required.

Requirements of a shippers' association are entirely compatible with the kind of organization commonly called a cooperative. In fact, one court has said, "A true shippers' association is a nonprofit cooperative, the members bear the burdens as well as share the benefits of its operations. They bear the expenses of the consolidation and distribution operation as well as sharing in any surplus monies that remain in the association's treasury at the end of the year." Freight Consolidators Cooperative, Inc. v. United States, 230 F. Supp. 692 (S.D. N.Y. 1964).

Example: After discussing qualifications and requirements for a shippers' association exempt under 49 U.S.C 10562 (3), a description of a properly operating association may be useful. Such a description was given by a Federal District Court in Dal-Worth Shippers Association v. United States, 211 F. Supp. 590 (N.D. Texas 1962):

> It was organized (in 1949) as a membership organization under the sponsorship of a group of merchants in Dallas for the purpose of reducing the cost of their transportation from their principal sources of supply. At a later date, the privilege of membership was extended to merchants in the Fort Worth area.
>
> The Association does not issue shares of stock. Membership is evidenced by a letter of acceptance of a member's application. Services of the association are rendered for members only. There are about 200 members at this time. Control of the association is exercised by a board of directors consisting of 21 persons, representing about 10 percent of the active membership, and an executive committee consisting of 7 members. Under present bylaws, the maximum membership of the board of directors is 25.

A manager is employed who oversees the clerical work which constitutes the day-to-day operation of the association. Bylaws permit admission of new members to the association by a majority vote either of the board of directors or the executive committee, although in normal practice a prospective member will be rejected or admitted by unanimous action. No members are solicited by the association or any of its officers. The directors all serve without pay.

The charges of the association are applied uniformly to all members, but vary as to individual shipments according to their contents and weight. Charges are fixed at a level which returns the cost and tax on the underlying transportation by rail and motor vehicle, consolidating charges, and overhead including depreciation, rent, salaries, telephone, office, and any other costs. If at the end of a 12-month operating period association revenues exceed the expenses, then pursuant to the association bylaws, the excess is prorated on the basis of tonnage and distributed back to the members. Refunds have never exceeded 1 percent of revenue for any operating period and have averaged one-half of one percent.

Once the operating and economic requirements of the selected system have been worked out, shippers and growers can design an organization most likely to meet their goals. The many decisions on incorporation, taxation, etc. will have to be made on the basis of needs and permissible bounds of operation. Such decisions, and the specific steps in implementation, should be made in consultation with a knowledgeable attorney. The overall goals of the shippers and growers should always be considered.

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